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THE

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I. THE POPULATION QUESTION.*

TO the patient and conscientious observer of social facts the population question transcends all others. Until it is solved all philanthropic movements, reforms, and the like, are wont to deepen the very evils they were meant to remove. Or at most they end in transferring penalties and burdens from the shoulders of those who have incurred them to their less guilty neighbours. Sanitary reform, education, temperance, in proportion as they become general, merely intensify the "struggle for existence," or, in other words, the internecine war between man and man.

But unfortunately few, in Britain at least, dare or care to ask whether at the bottom of all we deplore there does not lie the grim fact "too many sheep for the pasture"? If the supply of coal, of soda-ash, of chloride of lime, or any other commodity exceeds the demand, both employers and employed are ready to limit production; but when in a perfectly analogous manner the supply of men and women exceeds the demand, neither capitalist nor trades'-unionist sees the necessity of reducing the output, and, as human beings cannot be warehoused pending an upward movement in the market, untold wretchedness follows.

Into the vexed and difficult question in what manner the increase of population is to be kept within reasonable limits

* State Measures for the Direct Prevention of Poverty, War, and Pestilence. By A Doctor of Medicine. London: E. Truelove.

—whether, as originally proposed by Malthus, by "moral" means, or by physical methods as suggested by his successors—we do not here enter. But we purpose showing the nullity of the objections currently urged against restriction of population, and then calling attention to a practical difficulty which no Malthusian advocate has succeeded in meeting.

A silly plea sometimes met with is that, since Malthus wrote his celebrated work, regions scarcely known—such as the north-west of the Dominion—have proved to be of great importance as food-producing regions! But if water is running into a cistern at the rate of 5000 gallons per hour, and escaping only at the rate of 4500 gallons, it is idle to show that from an error in measurement the contents of the cistern are rather larger than it had been supposed. Such a discovery may delay, but cannot prevent the ultimate result.

The same considerations apply to the saving of food—which is equivalent to an increase of food-producing area—by reforms and improvements in the growing and cooking of food. Such steps may for a time better the condition of mankind; but if population constantly increases it must necessarily overtake the improved food supply.

The wildest of all contentions is that put forward by Mr. Henry George, who seems to think that the world could maintain a practically infinite number of men if its products were only more fairly divided. At all events he asserts that, on account of the indestructibility of matter and of energy, it could support a thousand billions of inhabitants as well as it now does a thousand millions. It is difficult to realise the mental condition of the man who founds on such data such a conclusion. Let us take an easy example:—Here is a plot of ground sufficient, say, for ten or a hundred apple-trees. All indestructibility of matter and energy notwithstanding, we find it vain to grow in it ten million or a hundred million such trees.

The properties appealed to by Mr. George determine the number of successive generations which may flourish on our planet; but upon the number of individuals of which each generation may consist they have no possible bearing. We may rest assured that all attempts to find a permanent solution of the population question by enactments on the tenure of land, schemes for confiscation, and the like, must be ever doomed to failure. That a finite area cannot continue to support a perpetually growing population is an elementary fact against which it is vain to struggle.

A bolder and at the same time more scientific argument was brought forward by the late Charles Darwin. He admitted that the unlimited increase of mankind was the cause of much misery; but he contended that this misery was the price necessarily paid for the improvement of our race, and that were it removed there would set in a reign of degeneracy and retrogression.

To meet this contention we must bring forward an illustration which is certainly not original, but which strikes us as being unanswerable:—Suppose two turnip-fields which have been sown in the usual manner. The owner of the one—he may be Mr. George, believing that a given plot of land will support any number of organisms, or he may be Darwin trusting in the "survival of the fittest"—leaves all the seedlings to grow and find sustenance as best they may. The owner of the second field, following the usual custom, hoes away all plants above the number which experience proves can find sufficient nourishment on a field of such size. We ask now which of the two fields will, at the end of the season, present not merely the finest and largest individual roots, but the best average? Everyone who has had any experience of farming knows that the competition field would, in sporting phrase, be simply "nowhere." Its finest roots would not bear comparison with the average of the field duly thinned out. We must remember, too, that in thinning out young turnips the farmer does not select for survival the most promising plants. He leaves simply those which happen to stand at the right distance from each other in the rows.

But we need not speak of turnips exclusively. In all farming and gardening operations, and in the rearing of cattle, no struggle for existence is tolerated. The grazier calculates how many sheep and oxen per acre his land will carry, so that each individual may find ample nourishment. The forester takes similar precautions with his young plantations, thinning out the saplings more and more as they require additional room. The gardener plants his young fruit-trees at what an outsider thinks wastefully wide distances apart; he takes similar care with all seeds which yield large plants requiring much nourishment, and he even thins out the clusters on his vines and the single fruits on his peach-trees, &c., on the same principle.

It will be noted that, though different methods are used in accordance with secondary differences, the one essential point is the same in all cases—the limitation of numbers in accordance with the space to be filled. Further, not only is

the struggle for existence suppressed between the individuals of the crops or the herds which we are rearing, but the watchful husbandman is ever seeking to root out every weed, to extirpate every kind of vermin which seeks to compete. It is not too much, then, to say that wherever he is able Man stamps out all competition, all struggle for existence, save, on the one hand, in wild animals and plants, and, on the other hand, in himself! Can we doubt that the results of limitation of number, in accordance with the means of support, would prove as beneficial among mankind as they are found to do among the lower animals and among plants?

It must not be supposed that we consider the struggle for existence an unmixed evil, or that we would advocate, were it possible, its absolute suppression; but we hold that it has far passed the limits within which it can stimulate to healthy action, and has entered upon its destructive phase. This is to be observed with heat, light,—in short, with all the requisites of organic existence. Up to a certain point they are necessary; beyond that, as it has often been proved, they are deadly. Just so with the struggle for existence. Where that struggle has been sufficiently intensified by the introduction of new weeds or voracious animals, species begin to disappear. Just so with competition among mankind. We see all types of human beings save the capitalist and the "working-man"—taking the word in its conventional sense—tending to disappear. Hence progress in Science and the Arts must come to a stand-still if the class of leisurely professional men and brain-workers generally is rooted out. What would Darwin have effected had he been flung into a competitive life,—chained, *e.g.*, to the merchant's desk, like Prometheus to the Caucasus? Nor, we will venture to say, could he ever have been born with the aptitudes and the powers which he actually possessed if his forefathers had been men of bustle and worry.

Leaving these considerations to be ruminated on by promoters of competition, we proceed to the great practical difficulty which lies in the way of Malthusianism. Unless universally adopted it must be a failure. Let us suppose that some one nation, some one race existing in any country along with other races, or some one class of society, limits the rate of its increase, whilst neighbouring nations, other races, or classes of society go on multiplying at their present rate: what must be the result? Simply this—that the Malthusian nation, race, or class effaces itself, and in any contest, whether waged with the bayonet or the ballot-box, it goes to the wall.

France has been for some time a Malthusian nation: her population has increased indeed, but much less rapidly than that of the neighbouring nations. From this restriction she has certainly reaped very tangible advantages; she has, so to speak, capitalised the funds that would otherwise have been expended on the nurture of an additional number of children. The competition, both for employment and for food, has been much reduced. But along with these benefits come certain drawbacks which French statesmen are beginning to view with alarm. They announce that the people of France form a much smaller fraction of the total population of Europe than was the case a hundred—or even fifty—years ago. They see that if the present state of things continues France will gradually subside into the position of a minor power, and in the event of war must be crushed by sheer superiority of numbers, just as was Denmark when attacked by Prussia and Austria.

But, leaving war out of the question, we see another method in which a Malthusian nation may be severely injured by its non-Malthusian neighbours, *i. e.*, by immigration. For what does a country gain by restricting the excessive increase of its own population if the room thus created is to be filled up by the influx of aliens, generally indifferent, if not actually hostile, to its interests? Even at present, with our rapidly increasing British population, there is a constant stream of immigration from the Continent which goes far to neutralise the benefit which we derive from emigration to the Colonies, and which is a most cruel wrong to the people of these realms. We may well ask, would not this alien influx greatly increase if we as a nation adopted the Malthusian system?

Again, we may see somewhat analogous results where different races co-exist in the same State. This we may observe at home. We have, indeed, in these islands nothing that can be called formal Malthusianism. But of the two main races of which the British people are constituted, the one—that of Teutonic origin—from prudential motives is apt to marry later than the Celtic portion. Hence it is considered by many ethnologists that in Britain the English and Lowland Scottish element is decreasing, whilst the Welsh, Irish, and Highland Scottish element is increasing.

In the United States of America analogous phenomena are observed. The true, typical Yankee, of English stock, observes the dictates of prudence as regards the time of marriage. The American citizen of Irish descent, and in the South the Negro and Negroid part of the population,

observe no such caution. Hence it is observed that the former element is becoming less predominant. We hear of districts in the New England States where the blood of the Pilgrim Fathers has substantially died out.

Something similar may be traced in Europe generally, in the different classes of society. In Malthusian France the families of the wealthy are generally smaller than those of the poor. In Britain the fact that what will maintain one person in plenty, or in comfort, will not maintain five or six in a similar style, is perfectly well known and acted upon. But the still more palpable fact that what will enable one person to exist will not do the same for five or six is completely ignored by those who claim for themselves the exclusive title of "the People"—with a capital P. The lawyer, doctor, engineer, or other professional man, defers marriage until he sees his way to the respectable maintenance of a family. The "British workman" too generally rushes into marriage as soon as he is "out of his time." Hence, mainly, springs the "bitter cry" of which we have lately heard so much.

Hence the more intelligent portion of the community—those who possess and are capable of transmitting to their descendants all the instincts of hereditary culture—are becoming relatively less and less numerous and powerful. Still more would this be the case if Malthusian principles were more fully adopted. We fear that "the People" would still refuse to recognise them, and would be encouraged in so doing by their political leaders.

The practical issue then is, By what spells can the recusant nations, races, and classes be convinced? In default of such general conviction we fear that Malthusianism must have a rather injurious bearing upon those who give it their adhesion.

There seems to be still a principial defect in Malthusianism as taught both by its original and its more recent advocates. It seems to ignore the truths which have been brought into prominence by Mr. Galton under the name of Eugenism. Certain States, we are told, in the work before us, permit no one to marry "unless he can show that he has a fair prospect of being able to maintain a family." To this the "Doctor of Medicine" objects, merely on the ground that such laws "prohibit marriages instead of prohibiting large families; and, secondly, because they apply only to the poor, and not to all classes of society alike." But would not the first step towards regulating not merely the quantity, but the quality of population, be to prohibit the marriage of all persons,

rich or poor, who are scrofulous, phthisical, syphilitic, or who show any tendency to lunacy? Yet we do not find, in the work before us, any hint of this kind. We flatly deny that any man or woman can have the right to multiply disease and debility. Those persons will scarcely agree with us who are prepared to sacrifice the well-being of the community to that of the individual.

II. RELATIONS BETWEEN SPIRITUALISM AND SCIENCE: MR. A. R. WALLACE AND R. M. N.

By the AUTHOR OF "SCIENTIFIC MATERIALISM."

"Any theory, hypothesis, philosophy, sect, creed, or institution that fears investigation openly manifests its own error."

ANDREW JACKSON DAVIS'S *Motto.*

(Concluded from page 464.)

PERSONS of rank and education have witnessed manifestations, and have given evidence of the truth of the facts. Professor Hare in America, and Mr. Crookes in England, applied the most delicate tests, and proved (in what might be called the minor physical manifestations) that there was no possible trick in the presentments they tested. What was the treatment they received? And then, in the face of such gross scandals, to talk of scientific investigations and other scientific, &c., is the merest irony.

As to the moral aspects of Spiritualism, so far as I have been able to trace the facts, they have had the purest and best results. I witnessed the phenomena in America, on its outbreak there. It is foreign to my purpose to enter into a defence of Spiritualism, to show the good it has done, and the benefits and blessings it scattered broadcast. I could state facts and name names where, in consequence of witnessing the manifestations, the characters of men have changed, and the result has been most beneficial. This

much I may say:—I have never known a person who became *truly* impressed by the spiritual idea who was not most radically improved in moral and social tone. At the same time it is not to be denied that charlatanry has entered largely into its precincts, and this is its difficulty: the same difficulty experienced by the Early Christians when base persons presented themselves as teachers, and cupidity (for means or rank) became its almost ruling passion. The sale of remedies, real or assumed, by professing spiritual mediums, and individual payment for *séances*, have wrought much of the mischief.

When R. M. N. talks of the harmony of Science and Spiritualism, and that it will "in the first place be necessary to discover the limits of the power of the Spirits, under what conditions it is exerted, and how it may be combatted when and where it may be undesirable," he will pardon me for saying that he has not given expression to much wisdom. Physical combinations and Spiritual manifestations have nothing in common, and cannot be governed by the same class of laws, and therefore they can never harmonise. To his question of physical facts, wrought as it is said by spiritual agency, the only answer that can be given is the well-evidenced facts and the assumption that such results have been achieved by some supermundane agency. The simplest and most stupendous of the manifestations, the subversion or the apparent destruction of Energy, tend to the same and only result, *viz.*, that there are powers in the outer world of the laws of which men know nothing; that the manifestations of those powers are the proofs that the world life is not the only life of man; that beyond the death of the creature, the soul or spiritual energy of man has an existence, a power and a life, verifying Shakspeare's beautiful ideal—

"I gazed within the jaws of death and saw life teeming."

In conclusion R. M. N. says—"My estimate of the visions of Swedenborg is founded on the fact that whilst he could furnish descriptions of planets known in his time, such as Jupiter or Saturn, he gives no hint of Uranus and Neptune. *Had he done so his visions would have been completely freed from the stain of delusion and imposture.*"

If R. M. N. had happened on a work, "Nature's Divine Revelations," by Andrew Jackson Davis, he would never have penned the sentence italicised by me immediately above, for in that he would find an evidence in favour of Spiritual seership which he pronounces would in his

estimation have freed Swedenborg from "the stain of delusion and imposture."

Before the doctrine of Evolution was known in America so as to be familiar, I have heard Mr. Davis, in a state approaching trance, deliver many lectures on subjects setting forth the same theories and principles as those contained in Mr. Darwin's "Origin of Species." In his normal state Mr. Davis was not particularly intellectual; in his trance state a very different estimate would be given of him. The matter *apropos* to R. M. N.'s observation on Swedenborg's delusion was a spiritual communication given through Mr. Davis (March 15 and 16, 1846) which applies to the planet Neptune, and was announced several months before its discovery by Prof. Galle, of Berlin, in September, 1846. Science, of course, could know nothing of Mr. Davis's predictions:—"*The ninth planet* (or cometary body), being composed of particles accumulated by the motion of the great Sun, observed the same plane by the same specific force" ("Nature's Divine Revelations," p. 165). "The eighth planet" (Neptune)* "was next evolved, observing the same principles of formation and the same general law of motion, and was situated in the orbit of the former merely because its composition was *more dense* than the first one evolved.

* From perturbations observed in the motions of the planet Uranus, it was supposed that they were occasioned by the presence of a planet beyond it. By the advice of Arago, Le Verrier was induced to investigate the subject of the motions of Uranus. Complete elements of the orbit of the unseen planet were finally deduced, making its longitude 325°, as seen from the Earth in 1847. Adams, in 1845, attacked the same problem which Le Verrier took hold of two years later. In October, 1845, Adams communicated to Professor Airy elements of the planet so near the truth that, if a search had been made with a large telescope in the direction indicated, the planet could hardly have failed to be found. The Astronomer Royal was incredulous, and deferred his search for further explanations from Adams. The extraordinary circumstance is that no account was immediately published on the subject of Mr. Adams's labours. In the summer of 1846 Le Verrier's elements appeared. Observations of the planet as a star were actually made on August 4th, and again on August 12th; but the observations, owing to Mr. Challis's engagements, were not reduced—so the fact that the planet was observed did not appear. In September, 1846, Le Verrier wrote to Dr. Gall, at Berlin, suggesting that he should try to find the planet. On September 23rd, 1846, the planet was discovered. Later investigation showed that Lalande had observed the planet both on the 8th and 10th of May, 1795, but did not verify it as a planet. The planet Neptune presents the appearance of a perfectly round disk, about 3" in diameter, of a pale blue colour. No marking has been seen on it. A ring was suspected, but observation showed this suspicion to be without foundation. One satellite only has been discovered (*vide* Newcomb's "Popular Astronomy, p. 358 *et infra*). Uranus has (as recognised) two satellites; Herschel supposed he had discovered six, but this has not been confirmed. Prof. Newcomb supposes there is a planet beyond Neptune; discovery has not yet rewarded his search.

. . . As the eighth and ninth planets have not yet been recognised as belonging to our Solar System, there can be no conception of the original magnitude and diameter of the Sun, as including its extended atmosphere" (*Ib.*, p. 165). The density of the eighth planet "is four-fifths that of water." Its "atmosphere is exceedingly rare, containing but little oxygen, being composed chiefly of fluorine and nitrogen." It has, like Uranus, six satellites" (*Ib.*, p. 167; *et vide* note, p. 169).

Mr. Davis also, in his trance state, insisted on the identity of materials throughout the Solar System. He says "that all matter and elements are fundamentally and essentially *the same*, and . . . a *different* law cannot govern any particle or element in the Universe from that inherent law eternally established." This view as to identity of material in the Sun and planets has since been confirmed by spectroscopic discovery. He also announced Faraday's discovery of Dia-Magnetism before it was familiarly known in America (*vide* p. 227, and an interesting note by Mr. Fishbough), and commented on its actions in Cosmic relations. Surely enough has been said to disabuse R. M. N.'s mind that revelations of mediums are not all delusions. The hostility of the Scientific and Theological world has much of the tone of the cry of the Jews. Can any good come from Nazareth? was there ever a prophet from Galilee?

Science in general deals with tangible phenomena, and because the scientist in his manipulations does not find a visible God, therefore the learned and would be all-knowing scientific theorists reject the interposition and idea of a God; hence arise Agnosticism and Materialism. Fortunately these observations have not universal application, for there are men of Science great in achievement and grand in ideas. How men can dive beneath Cosmic realities and yet deny the designer, it is difficult to understand, for the appreciation and confession of belief in the existence of God pledges to no Theology, nor enchains the acceptor in the meshes of Dogma.

In the investigation of phenomena there is always the presence of the unalterable law. If there be law, an institutor of that law must be assumed: this is a logic many are not equal to. In phenomena is found a sequence of effects induced by preceding causes, which sequences of causes predicate design, because from no concatenation of chances could order and uniformity result. It were quite

as feasible and in point to deny the existence of mind because it cannot be put in a crucible and brought out a thought, as to deny design in Nature. When we look at a steam-engine and see the mighty results compassed,—the crushing power of the avalanche, or the tap gentle as the sighing of a zephyr, — no one thinks of the mind of the designer and the intelligence by which the almost living machine is produced, but without which none of the results witnessed could have been produced. So is it the theoretical scientist looks on so-called natural phenomena; he looks only to results. The designer of the steam-machine is known, and if enquired for he cannot be ignored, and the effects produced by the machine remain but effects. How small, indeed, when placed in contrast with the operations of Nature! It is indeed a poor logic which sees and profits by effects, and then denies the intelligence by which they were produced. Spiritualism discloses an occult power. What is its predicate, and where shall it stop?

The one result which the manifestations have produced (whatever more they may have done) is their proof of the existence of an occult world, at present beyond the reach of scientific investigation, of which the once denizens of this world are the inhabitants, and who have the power (regulated by certain conditions) of communication with beings of this life. The all (as I understand it) that Spiritualism claims to teach is the deathless life of the soul. Whatever other inferences its professors and believers please to draw from the manifestations are entirely matters for their own reason and faith. Spiritualism can no more harmonise with Science than Science can harmonise with Religion, for each have separate domains and move in separate directions: the one is casual (Science and Theology), the other causal (Morals and Faith).

III. THINGS *VERSUS* WORDS.

By Frank Fernseed.

IN the spring-time of the present year I was wending my way along a field-path in one of the Midland Counties —the exact date and place being quite irrelevant. From a bush there suddenly rose up a "brimstone" butterfly (*Gonopteryx rhamni*), a survival of last season, and skimmed along over the top of a hedge until it was lost to sight. A little further appeared a "small tortoise-shell," old and shabby, but disporting itself after the fashion of its kind. The thought at once came home to me,—how different are the respective flights of these two species, and how readily an experienced entomologist can distinguish them by this attribute alone, even if too remote to note their characteristic forms and colours!

Here, however, the courteous reader will look round, fully prepared to inflict upon me, in spirit at least, the traditional pinch which in my school-boy days was duly awarded to the bringer of old news. Said courteous reader is in one respect right. The fact is not novel. It has been already pointed out in a much more complete and general manner. There are veteran Lepidopterists who can identify by its flight, if not every British species of butterfly and moth, yet at least every group. But not one of these specialists—and here we come to the point—can describe the flight of each form in such language that a non-specialist would be able to identify the insect by the description of its flight. I may even go a step further: the specialist, however complete and accurate his knowledge of the flight of an insect, will not have this knowledge in all its details stored up in his own mind in the form of words.

It must not be for a moment supposed that the peculiar movements of insects, or of any other animals, are the only properties of things which cannot be described accurately in words. We can, by means of language, put on record with precision the words which have been used by other persons, or our own thoughts and emotions; but when we come to things we can give account of them only to a very limited extent. We can state their number, their weight, their dimension, and their forms, in as far as the latter can be reduced to simple geometrical elements, and everyone

will understand us; but the shape of any object, if complicated and irregular, its colour, its smell, its taste, we cannot so describe, save by reference to some other object with which our hearers or readers are supposed to be acquainted. Without some such reference our account of the object is extremely vague,—so vague, in fact, as rarely to lead to its identification. I will take a very simple instance. You tell me that some given object, or some part of such object, is *red*, and you may speak truly. But how am I to know which of the hundred shades, commonly known as red, is the precise one which you mean? Is it a brick-red, or a rose-red, or a blood-red, a cherry-red, or a poppy-red? Is it a red which reflects the same colour from whatever side it is viewed with regard to the light, or does it change like the elytra of certain beetles, the abdomen of the fire-wasps, or the throats and breasts of some humming-birds? Without an answer to these questions the inquirer can form no definite idea of the object in question, and without he has a knowledge of the standards of comparison he cannot comprehend the answer.

We may read in chemical text-books that on bringing certain substances in contact, or on heating them to a high temperature, there takes place a change of colour, a precipitate of some given shade, or a flame which, as the case may be, is blue, green, purple, &c. But the student who merely reads these statements, or hears them uttered by a lecturer without actually seeing the results, forms but a very vague imperfect notion of the facts. To this point attention is now being directed. A chemical manual, recently published in America, is illustrated with portions of the actual precipitates produced, cemented upon slips of paper, and the transitory changes of colour produced in certain solutions by contact with various reagents are imitated as well as possible.

Again, the student is now often told that in order to get a clear notion of any novel reaction, he must not merely produce it with materials of known purity, but he must make trials with substances which give a closely approximating result, so that he may note the shades of difference.

All such instructions convey the admission that language, however invaluable, is a very poor, imperfect, medium for retarding and conveying accurate observations.

I turn from colour to form. If I say that some unknown object is of a triangular or of an hexagonal shape, everyone understands me. But suppose I have before me some newly-discovered animal or plant, how can I describe it so

that the general public—educated verbally—can form even an approximate idea of its shape? Words, no matter how skilfully used, will be of no manner of service. I must either give an illustration or—if speaking to naturalists—I must say that the new being is like some known group. Thus if I state that it is a Buprestid every entomologist will know its general features, and its especial peculiarities can then be explained by language, which, however, would be quite unintelligible to such as have not first made themselves acquainted with the thing for which each word stands as a symbol.

In like manner I might go on with the texture or the feel of various objects. Here language is much more impotent than it is in case of shapes and colours. Ask an experienced wool-broker to put into language the characteristics by which on handling a sample wool he judges of its properties. He will laugh at the request as involving a sheer impossibility. He will say that in his experience he has observed certain points in the feel of a wool which indicate its practical value. These points have fixed themselves in his memory, but he has never clothed them in words, and does not know how to attempt it. It is sometimes overlooked that we can, and do, distinctly remember and identify sense-impressions without the use of language at all. We now understand why practical men always say "It is of little use reading about a process; to understand it you must see it done, and do it yourself." And this holds good in the laboratory—physical, chemical, or biological—just as fully as in the workshop.

We now come to an absolutely tremendous *à fortiori*. If language, unaided by illustrations, diagrams, models, and specimens, gives us such a misty, inaccurate notion of the colours and forms of objects, how much the more does this hold good of tastes and smells! For expressing tastes we have a very scant vocabulary. We speak of sweet, sour, bitter, saline, savoury. Beyond this range we help ourselves out with reference to substances of known flavour. But these substances may not be known, and when they are known the similarity is never absolute. There are shades of difference which we recognise and remember, but of which we cannot speak. Where, for instance, is the language in which an experienced tea-taster or wine-taster can record or transmit his knowledge?

With odours the case is yet more decided. Beyond such generalities as pleasant or unpleasant, sweet or nasty, we have absolutely no terms at all at our command except

comparisons or references. Hence we constantly find in the text-books, when the properties of any object are being described, such remarks as "Its smell somewhat reminds us of" &c. Yet odours, at least on a person who does not deaden his olfactory organ by the use of narcotics, make very well-defined and permanent impressions. I know an instance where the scent of buchu, once experienced, was distinctly and at once identified nearly forty years afterwards. This proves that, as I remarked above, we can remember and identify sense-impressions directly, without the intervention of language. The person who thus recollected the smell of this herb had no name for his sensation, nor do I see that if he had applied some name to it he would have been by that means at all the better enabled to identify it when again met with.

Indeed it will be found, as a general rule, that we remember our observations, or at least our sense-impressions, directly without the intervention of language, and that we only seek to clothe them in words to aid in communicating them to others.

Seeing, therefore, from the few examples I have brought forward, how very impotent is language, *unaided*, to convey precise knowledge, the question arises—Why is such exclusive attention paid to words, both in lower and higher education, to the almost entire neglect of things? Verbal memory is cultivated above all other faculties of the human mind. Much care is taken to train up youth in the correct use of language. But in what school is the art of observation systematically taught? Who heeds or asks whether the observing faculties are strengthened? Quite the contrary; these faculties, if perhaps not intentionally, are not the less weakened and crowded out by dominant verbalism.

It is sometimes said—and said most falsely—that if the mind is, at the outset of its growth, trained in words and abstractions, it will afterwards deal with things all the more successfully. This assumption has been refuted by the direct experience of Prof. Galloway, M.R.I.A., who has put it on record that the junior classes of boys in schools understand and profit by lessons in Chemistry better than do their seniors, whose observant faculties and whose power of learning from things had been relatively weakened by their longer course of grammar-school training.

But the all but exclusive attention paid to words, and the corresponding neglect of things, engrained as it is in modern systems of education, and though it is the very heart and

soul of Examinationalism, cannot be pronounced of modern origin. For centuries original research and observation were practically non-existent in Europe. The only task of the man of learning was to study not Nature, but books; to comment on, discuss, and expound the doctrines of "the Ancients," without any attempt to increase or to rectify the existing stock of human knowledge. Legend represents the sage not as observing and experimenting, but as reading.

To such a length was this carried that the spoken or written word came to be held synonymous with reason. In the East, to this day, a book, a scroll, even a scrap of paper, is looked on as well-nigh sacred.

How came everyone to forget that knowledge must have its origin elsewhere than in books, as otherwise no books could ever have been written? Why was the cistern or the bottle, foul often or dirty, preferred to the spring?

To form even a probable conjecture we must look back to the pre-historical ages,—days innocent of fossil gossip. Man, from the earliest date at which he could be called man, would certainly observe. A part of the knowledge thus accumulated would be handed down even without oral tradition. The young would remember and practise the arts which they had seen exercised by their elders. But much would, for want of any permanent record, be forgotten, and die with those who had collected it,

Hence we may easily conceive that when language reached such a stage as to admit of the transmission, and consequent accumulation, of knowledge in the form of inscriptions, our early forefathers were intoxicated with the value of the step thus gained. They insensibly began to pay less attention to things and more to words, which, as we have just seen, are often but very dim, indistinct transcripts of things: this error seems to have grown until it culminated in the "Socratic apostacy" from which we only returned in the days of Bacon and Galileo. Even now, as I have urged, words still receive the lion's share of attention. In England until very lately men ran through the highest attainable curricula without anything but mere verbal training, and if in after life they proved capable of dealing with anything beyond words and abstractions it was simply in spite of their education. It is to be feared that now a verbal education is being forced upon the lower classes the "vice of inobservance," which has hitherto haunted the higher orders, will be in danger of infecting the whole nation.

In taking my walks abroad I have not unfrequently met

with men sheer devoid of literary culture,—unable even to read or write,—but yet good observers who can point out unrecorded facts in Natural History, Meteorology, &c. But, so far as I can trace, the disposition to observe is less prominent in the rising generation. Those who have been duly hunted through the "standards" seem more prone to study the "penny dreadfuls" than the Book of Nature.

I am not seeking to undervalue the use and the study of language. It furnishes, at any rate, receptacles in which the rough outlines of our knowledge may be preserved. But it must no longer seek to maintain the exclusive position which it has usurped. It must be made to feel that it is the espalier and not the vine, the purse and not the money, the shell and not the substance.

An American Professor of Botany not long ago contended that the true way to teach that science was to begin with the actual plants, and refer to books merely to co-ordinate the facts which the student has been led to observe for himself. The text-book, as I have endeavoured to show above, will be definitely intelligible to the man who uses it in this manner, and to him only. All who begin with books, or refer to the actual objects merely—if at all—in illustration, will form such vague notions as a man might form of textile fibres if he handled them with gloves on.

Another American writer who has discussed this subject puts forward a very suggestive consideration:—If language has been evolved, as the scientific world now believes, the observation of facts must have long preceded the elaboration of language. If, then, the evolution of the individual mind is to follow the same course as that of the species, grammar should assuredly be not one of the earliest, but of the latest, studies which the young should take up.

IV. ARSENICAL POISONING BY WALL-PAPERS AND OTHER MANUFACTURED ARTICLES.

By JABEZ HOGG, M.R.C.S., F.R.M.S., &c.,
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IT has been very generally recognised that some persons are never well in any given place, or particular locality, long together. In such a case it is commonly said this or that place, or locality, does not agree with them, and, after failure of remedies, change of air is tried with marked improvement; but this proves, in the majority of cases, to be only of a temporary nature. The amount of distress inflicted in this way, in a large number of households, is of no light or insignificant character, and the cause long remained concealed from observation. It is only of quite modern date that a clue has been obtained to certain of the "mysterious illnesses" referred to, and which for yeas were vaguely assigned to some inexplicable cause, —an "idiosyncracy," "antipathy," or peculiarity of constitution.

It is now known that many remarkable and insidious forms of disease are entirely due to certain insanitary influences; that the lurking poison which infests our homes by night and by day may at one time, from defective drainage, find its way into the house through the sewer, to be absorbed in the drinking-water, or, by putting on other kinds of disguises, may for a time baffle the most observant and learned expert.

Who would, indeed, have thought that a deadly poison could lurk in a pretty and attractively coloured wall-paper, a newly-painted decorated room, an attractive article of dress, the chintz of the window-curtains, the stockings, the gloves, the playing-cards of the whist party, the candles and lamp-shades, the children's toys, and the "sweeties." Yet in all of these, and many other articles in domestic use, arsenic enough has been found to produce a large amount of disease, and in some cases death.

It is an unquestionable fact that the health of the community is imperilled by the large use of arsenical pigments and other poisons in the manufacture of articles in general

use among us. There is no longer room for doubt of the truth of this assertion in the minds of those who have carefully inquired into the subject. Nevertheless public feeling has not been aroused, at least to an extent sufficient to produce any very marked effect in diminution of the evils which the physician and the chemist have from time to time endeavoured to bring prominently into notice.

In the investigation of an obscure or hidden disease the medical man, in any and every case, is given to associate facts and group together symptoms; and should he find that these recur in pretty much the same order, in a number of cases, and if some distinct or special pathological condition is seen to underlie them and constantly reproduce them, then he considers that he is justified in regarding them as an unmistakable indication of cause and effect. By careful observation it has been found that wall-papers coloured by arsenical pigments will produce, and do produce, a series of symptoms of poisoning which are not only significant, but perfectly conclusive of poisoning by their agency.

It is a well-recognised fact that those persons who are "susceptible" to the action of such potent toxic agents as arsenic, and who may be compelled to occupy a bed-room the walls of which are covered by an arsenical paper, will certainly suffer in health therefrom. That this is so receives additional strength from the fact that immediate relief from a series of distressing symptoms is experienced on removal from the room and its surroundings, and which always recur on their returning to the apartment, or even to the house.

It is a fact, then, that sufferers from arsenical wall-paper poisoning invariably experience perfect relief from all their distressing symptoms on trying change of air,—nay more, by changing one room for another. Any permanent change produces a cure. But on their returning to the influences or surroundings which were the original cause of the illness, they just as surely experience the same train of distressing symptoms which in the first place was the cause of the "mysterious illness."

It may readily be surmised, from these few introductory observations, that the question of arsenical poisoning is in many respects an important one for individuals and for households. From the large number of cases of poisoning already made known by the medical profession and by analytical chemists, I gather that the evil is widespread, and the danger arising therefrom can in no way be exaggerated.

The late eminent chemist and toxicologist Dr. Alfred Taylor was the first to put the public on its guard against

secret poisoning by arsenic. He appeared as a witness before the Select Committee of the House of Lords in 1857, at the time the "Sale of Poisons Bill" was under dicussion. Dr. Taylor desired to get a clause inserted in this Bill which should regulate the use of arsenic by manufacturers, but it was urged on their part that it would hamper and injure trade. But although he failed to accomplish his object, he succeeded in arousing the attention of the medical profession to the question. Up to this time even medical men were not fully aware of the danger to health. From this moment very many cases of chronic poisoning by wall-papers were discovered and made known,—illnesses of an unaccountable and perplexing nature were at once understood. Curiously enough, among the greatest sufferers from arsenical papers were several well-known medical men, including Dr. Hinds and Dr. Halley. These gentlemen, happening to read Prof. Taylor's evidence, came to the conclusion that their own distressing symptoms were the result of chronic slow-poisoning by arsenic. In a short time their surmises were corroborated by the great change brought about in their symptoms by simply stripping off the bright green papers hanging on the walls of their consulting-rooms. About the same time the wife of a London surgeon died after much suffering from symptoms which Prof. Stenhouse, after analysing the wall-paper of her room, pronounced "highly arsenical." Dr. Lauder Brunton was inclined to think the evils said to arise from arsenical poisoning much exaggerated. Soon after, and from bitter personal experience (his study having been papered with arsenical paper), he changed his opinion.

In 1879 a Committee of Inquiry was appointed by the Medical Society of London, of which I was Chairman. In the course of a few weeks no less than fifty-four reports of cases reached me of arsenical poisoning by wall-papers, twenty-four of these occurring in the persons or families of the medical men themselves. This, I think, is strong evidence of the difficulties attending the diagnosis or recognition of this form of illness, poisoning, and tends also to show that the better opportunities for observation afforded to a medical man in his own house may lead to the detection of mischief, which in the person of a patient would escape attention, mar his diagnosis, and mislead him as to its proper treatment. This is so because the gastro-intestinal irritation that attends the internal reception of the poison is mostly absent. It has been discovered, too, that different individuals exhibit very different degrees of suceptibility, so

that one person will merely complain of chronic sore throat, another suffer from inflamed eyes and excessive nervous prostration, while it more rarely occurs that the virulent nature of the arsenical poison produces so rapid an effect as it did in the case of Mr. E. H. Corbould, the accomplished water-colour painter. This gentleman was summoned to Osborne to execute a particular work for the Queen, and for which only a very short space of time was allotted; he was therefore obliged to take up his abode at an hotel near the palace. In a couple of days he was a sufferer, as he thought, from a severe cold in the head: this he attributed to the damp state of the bed-room, the wall-paper (a green one) being a good deal discoloured. Her Majesty, hearing of his illness, with her usual consideration for the comfort of those about her, gave instructions to an attendant to have him removed and lodged in Victoria Cottage, close to Osborne, and, furthermore, to see that a good fire was lighted in his bed-room early in the evening. These instructions were carefully carried out, and he found a warm room, a cheerful fire, and every comfort on his arrival. The bed was well covered with the best Witney blankets, and a couple of spare ones ready to hand. After partaking of a little hot brandy and water he gladly crept into bed: in a few minutes a chill seized him, and he was glad to pile on another blanket. He still felt cold, and drew the second blanket over his bed; but in vain,—the chilly feeling caused "his teeth to chatter"; sleep was out of the question. He bethought himself of his well-lined Spanish cloak lying on a chair near the bed, and made an effort to reach it: to his horror he could not move his legs; he was paralysed, and could neither move arms nor legs. He made a violent effort to put his legs out of bed: this produced a painful cramp of the bowels, and this was immediately followed by sickness; soon after he lost consciousness, and remembered no more of what occurred. At 8 o'clock the following morning he was aroused from his insensible condition by a loud knocking at his bed-room door; he was scarcely able to say "Come in," or ask for a cup of tea. In a few minutes the servant returned with the tea, and pulled up the blind: he opened his eyes, and, seeing the brilliant green of the paper on the bed-room walls, excitedly exclaimed "I am poisoned." The servant, in great surprise, declared she had given him "nothing but the best tea." He explained, as he drank it, that he alluded to the paper on the wall. He made an attempt to get out of bed, and

his legs gave way under him, and he staggered about like a drunken man. As soon as he could he opened his door and got out, and reeled to a window that stood open in the corridor. The fresh cool air of the morning seemed to infuse new life into him; he breathed more freely, and gained power over his limbs; in a few minutes he was able to make his way out of the house. As he walked up the green sward every disagreeable symptom vanished. The Queen was waiting for him, and remarked he was late, and he was obliged to confess that illness was the cause; at the same time he stated that he had been poisoned by the wall-paper of his bed-room. Her Majesty expressed great sympathy, and at once commanded an attendant to have a piece of the paper stripped from the wall of the bed-room and brought to her. This was submitted to chemical analysis, and found "highly arsenical." This interesting case shows the extraordinary susceptibility of some persons to arsenical wall-paper poisoning. At the same time the remarkable activity of the toxic agent may have been gently promoted by the temperature of the room, and its having been occupied for the first time after repairing and painting. The poison doubtless entered the circulation through the lungs in a gaseous form (hydrogen arsenide), thus producing anæsthesia, then followed arrest of the heart's action, and paralysis of the nervous centres. In some cases, coma and death ensue.

In the greater number of cases arsenical poisoning takes place slowly and insidiously; it begins with headache, dry cough, oppressed breathing, giddiness, and sleeplessness; the limbs are painful, feeble, trembling, and benumbed. In other instances it attacks the surface of the body, causes chronic skin disease, or the fingers and arms are covered with painful sores. In an establishment where a hundred young girls were constantly employed making artificial flowers and leaves, the greater number of them suffered from eruptions and painful cracking of the skin of the fingers and flexures of the arms. Twenty-six of them presented other symptoms of chronic poisoning, and one died, after months of great suffering, from ulcerations attacking various parts of the body.

Workmen while engaged in stripping off old wall-papers from rooms, preparatory to re-papering, are frequently obliged to leave their work from attacks of diarrhœa and other stomach derangements. Hundreds of instances of dangerous illnesses have been published, from time to time, which fully confirm what has been stated with regard to the

reckless use made of arsenical pigments in various manufactures, and the dangers arising therefrom.*

On the other hand, it has been said that some exaggeration has taken place with regard to the numbers of the sufferers from arsenical poisoning, and that the subject has been hitherto treated too sensationally.

We have been credibly informed, also, that the men employed in the manufacture of arsenic in no way suffer from arsenical symptoms, and that on the whole they enjoy good health. The Inspector of the Cornwall and Devon mineral mines, Mr. R. Hunt, says the miners are a healthy set of men, and those engaged in arsenic mining make no complaint of the unwholesomeness of the work. The miners of Upper and Middle Styria are actually given to chew small pieces of crude arsenic, and believe in it, as men do who smoke and chew tobacco. It is said to relieve hunger, and give increase of strength. It is also supposed to be a protective against the fumes arising from the reducing-furnaces.

On careful enquiry by competent persons the conclusion come to is that there is some exaggeration in these statements. It is, however, quite probable that men do chew minute pieces of crude arsenic with impunity; but then crude arsenic is insoluble, and may pass through the stomach without having been acted upon by its secretions. Many cases have been published that prove the truth of this assertion. But the case is very different when we have to deal with a perfectly soluble salt of arsenic, as the trioxide. Of the many arsenical preparations used in our manufactures the most dangerous, because the most extensively employed, is the trioxide. This is the principal ingredient in Scheele's green, a pigment composed of 1 part of arsenic trioxide and 2 parts of cupric oxide. Schweinfurt, Brunswick, Vienna, or emerald green, aceto-arsenites of copper, are all rather extensively used, mixed and unmixed, with such other materials as zinc oxide, in producing more delicate tints of colour. Another pigment, composed of chromic and ferric arsenate, is much employed, while arsenic acid enters into very many manufactures, aniline dyes in particular. Roseine, for instance, is produced by the arsenic acid process.

In wall-paper printing, as in many other textile fabrics, the arsenical pigment is invariably mixed with zinc and some

* For further details of numerous interesting cases of poisoning by arsenical pigments see a paper of mine in "The Sanitary Record" of April 25, 1879, and "Medical Press," 1879; also Mr. Henry Carr's useful work, "Our Domestic Poisons," published by Ridgway and Co., and in which appears a list of numerous other publications on arsenical poisoning

organic matter. This is done with the object of causing the colouring-matter to adhere to the paper, muslin, or calico, and in consequence its mischievous effects are likely to be augmented, for the fabric on becoming thoroughly dry will be detached by rude handling; the surface cracks, and the pigment is loosened, when considerable quantities of arsenical dust will be set free.

In the case of a wall-paper hung on the walls of a room, every increase of temperature will liberate a quantity of the surface-dust, which settles on the furniture; or the arsenious acid, which is of an extremely volatile nature, may be changed into hydrogen arsenide and diffused by every movement of the air. But I am reminded by an objector that the quantity of dust thrown off under any circumstances is far too small to produce the dangerous and disagreeable effects in the human economy such as I have spoken of. This, at least, is a hasty conclusion to jump to. Professor Taylor found that from each square foot of an arsenical wall-paper he could obtain from fourteen to seventeen grains of arsenic, and that from some flock-papers he actually obtained as much as fifty-nine per cent of arsenic. Other chemists have succeeded in eliminating a quantity of hydrogen arsenide from wall-papers, and have in fact obtained from each cubic inch of gas one grain of arsenic. Dr. Fleck, of Dresden, repeating his experiments, satisfied himself that the element of greatest danger is found in the evolution of this gas by the joint action of heat, moisture, and the organic matter used in printing and hanging the paper. Professor Sir H. Roscoe takes a similar view; and Dr. Hamberg, of Stockholm, who was himself a sufferer from arsenical wall-paper poisoning, having repeated Dr. Fleck's experiments, convinced himself that the respiration of hydrogen arsenide in a comparatively short time will produce symptoms of poisoning. Within the body this gas or dust may produce other poisonous compounds by decomposition of albumin. Professor Selmi discovered that a volatile arsine was formed by contact of arsenious acid and albuminous matters, and that the new compound formed exhibited a toxic action differing from that of arsenious acid; he further expresses his belief that a similar product may be formed from the size used in making the wall-paper and the paste employed in fixing it to the wall, and if so, the moisture of the air would play an after important part in the formation of a poisonous material, *arsine*.*

* The enormous volatility of the arsenious tri-chloride necessitates special precautions in its preparation. The gas evolved is driven off at a very low

But whether the greater activity of the arsenical wall-paper poison is due to the crystalline particles separated, thrown off, from the surface of the wall-paper, or liberated by albuminous decomposition or recomposition, as hydrogen arsenide, it is scarcely possible to say. This after all is a question of far less moment to the public than to medical men and chemists. At all events the difficulty is just as great with regard to lead poisoning. It is almost impossible to conceive, much less explain, why a person sleeping in a newly-painted room should find himself unable to move hand or foot on waking. He at once becomes a sufferer from lead paralysis, and no one has yet detected either carbonate or oxide of lead, or other subtile agent, diffused throughout the air of the room. Nevertheless, it must be so.

If, then, as I have shown, arsenical wall-paper poisoning constitutes a serious and pressing danger to health it will surely not be denied that the use of arsenic in our manufactures should be placed under some restrictions. By the intervention of the Foreign Office we are in a position to say what is done in this respect by the Governments of other European nations. As regards Germany, the use of poisonous pigments in wall-papers, and in other fabrics and materials likely to affect health, are absolutely prohibited by law. By an imperial Law issued in 1879, all colours deemed poisonous are fully enumerated. The use of Scheele's green and of all other arsenical and poisonous colours for wall-papers and clothing are therefore prohibited, not only by the laws of Prussia, but by those of nearly every minor State. An exception was subsequently made in the case of papers, &c., intended solely for exportation, so that German manufacturers might not be placed at a disadvantage in competeing with French firms; but the restrictions imposed on the use of arsenic were found so onerous and harassing that the manufacturers themselves found it the more profitable course to discard arsenical colours altogether.

In the kingdom of Saxony legislation has been of a piecemeal character: the use of a green precipitated copper carbonate on cotton yarn having been forbidden in 1840; of a Brazil or Munich red, an arsenical colour in 1856; of Schweinfurt green for fabrics and papers in 1860; and a warning issued to the public against the use of arsenical colours in sleeping or much frequented rooms, and in forms

temperature, and will pass over before a single drop of condensed liquid enters the receiver. So difficult is it to obtain in solution, that Hufschmidt convinced himself that every trace of the trichloride remains in the receiver, whether it be filled with water or solution of potash.

easily detached. In Saxe-Cobourg and Gotha ducal edicts have been in force since 1839 prohibiting the use of arsenical pigments for all domestic purposes, and a scheduled list of dangerous articles given which must not be introduced into articles of food or drink. The Hessian Criminal Code of 1855 is more stringent, and specifies a number of colours which, though not coming within the category of direct poisons, are of a poisonous nature and injurious to health; it not only regulates their use but prohibits their sale by chemists and others, thus far more nearly corresponding to the "Sale of Poisons Act" of this country.

In Bavaria a law of 1863 enacts that arsenic is not to enter into colours and paints for house decorations, window blinds, wire gauze for meat safes, artificial flowers, &c. In Sweden the question of arsenical colours has been the cause of much discussion at home, and of negotiations with the Governments of other countries. The ordinance of 1876, which regulated the manufacture, storage, and sale of poisons of all kinds, unconditionally prohibited the use of arsenic in wall-papers, cloths, blinds, artificial flowers, and wares of all kinds, as well as in lamp-shades, sealing-wax, wafers, and candles. It was thought carpets were not included, but the Courts ruled these as an accidental omission and they were accordingly included, carpet sewing having in some cases produced arsenical poisoning. By the Act every purchaser of an article possibly arsenical can have it analysed and certified by the Government chemist. It also fixes as the limit of security in wall-papers, namely, that the metallic arsenic deposited in a glass tube of $1\frac{1}{2}$ to 2 millimetres internal diameter from 440 square centimetres of these articles, or from 220 square centimetres of textile fabrics and 21 grains of other articles, by the Babo or Fresenius process, shall not produce a black, brown, or even a partially opaque arsenical mirror.

Denmark and Holland stand next in point of stringency of their regulations on the use of arsenic and other poisons in the arts. In Denmark a law has lately come into force based upon that of Germany, and which prohibits the use of arsenic in wall-papers, carpets, window blinds, artificial flowers, and fabrics of all kinds, and in all descriptions of paints, distemper, or colouring for walls, or decorative purposes. 2. The use of lead in toilet articles, and in enamelling or tinning cooking utensils, or of oxide of lead or zinc in india-rubber for infants' feeding-bottles, toys, &c. For the use of arsenic, antimony, lead, chromium, cadmium, copper, cobalt, mercury, lead, zinc, and of gamboge in toys,

or for colouring confectionery, foods, and drinks. Colour-boxes containing any of the above are to be labelled "poisonous colours."

Holland has just passed a law which makes it a crime to sell any article of merchandise of a poisonous character without giving the purchaser full information as to its precise nature. If any article be sold without this notification the vendor is subjected to a fine not exceeding 300 florins, or imprisonment for a term not exceeding six months. Should death follow as a consequence of the sale, the seller is liable to imprisonment for a term not exceeding one year if he were ignorant of its nature, and to various other terms—even for life—if he knew the nature and the probability of such a result.

In France the use of poisonous colours is prohibited in articles of food, but as to others not intended for consumption no prohibition is in force, and the Government contents itself by the issue of a circular cautioning manufacturers of the responsibility they incur in case of poisoning, and their liability in consequence under the penal code.

In Italy the sale of poisons is strictly regulated by law. The sanitary code of the Commune of Venice includes among its poisonous colours the juice of the phytolacca, much used in Portugal for colouring port wine. It forbids also the use of lead or copper in the manufacture of articles not tinned and polished, in utensils for the preperation of articles of food and drink. In pewter-pots and metal tea-pots not more than five per cent of lead or of antimony must enter into their composition.

In Greece and in Roumania poisons are not allowed to be sold by other persons than registered chemists. The use of poisonous colours is prohibited in certain articles scheduled. In Servia the Government medical officers and analysts may at any time enter and inspect all places where poisons are used, manufactured, or sold; and if fatal consequences ensue on a breach of the law, the offender is made amenable to the criminal courts.

In Switzerland the Federal laws bearing on this subject are very variable. In some cantons the laws simply regulate the sale of poisons. Geneva, Berne, St. Gall, and Zürich alone have very explicit legislation on the subject. In the first-named all poisonous colours, inorganic or vegetable, are prohibited in articles of food, in wall-papers, and fabrics of all kinds.

In Berne, arsenic, aniline containing arsenic, and metallic colours generally are forbidden to be used in food, toys,

wall-papers, and textile fabrics. Copper utensils are also required to be tinned. In other cases paints for internal decorations, and all articles of domestic use, are included and enumerated. The most complete regulations are those met with in Zurich, where, for the colouring, painting, and ornamentation of articles of food, drink, and clothing, the paper envelopes of food used in confectionery, toys, wall-papers, window blinds, wafers, &c.; the employment of colours containing any compound of arsenic, lead, copper, antimony, zinc, mercury, or bismuth are absolutely prohibited. Imported articles containing any prohibited colours are not allowed to be sold.

In Austro-Hungary there is an Imperial law forbidding the sale of poisons, but it imposes no restriction on their use in trades and manufactures, while in Spain and Portugal there are no laws whatever bearing on the question of poisons. From what we know of the backward state of therapeutics and medicine in these countries this is not surprising.

It is but right to state that harmless pigments of proved utility and value have been prepared to replace arsenical colours in the manufacture of wall-papers in this country, and that every precaution is now taken by the larger firms of wall-paper printers to prevent as far as possible the use of poisonous colours, or those likely to be injurious to health, being introduced into their printing works. They buy only colours guaranteed free from arsenic.

Some months since the Council of the National Health Society appointed a Committee of medical men, chemists, and others to collect information as to the effects on health of poisonous pigments and colours in articles of home decoration, domestic use, and wearing apparel, with a view of obtaining legislative action in this important subject. A Bill has been framed, which, it is hoped, will be early intro- into the New Parliament, and without much further loss of time placed on the Statute Book.

V. ON THE SELF-PURIFICATION OF WATERS AND SOILS.

FEMICH has carried out a series of experiments on the behaviour of water when allowed to stand exposed to the air, and also when shaken up with air. He has further experimented with sterilised water, and on the behaviour of waters submitted to the action of ozone and hydrogen peroxide. The self-purification of water—in other words, the destruction of its organic and inorganic impurities—may be the consequence either of a purely chemical process (oxidation) or of a biological process. It appears that on exposure to, or agitation with, air the self-purification of water takes place only if it has not been previously sterilised by boiling, and protected afterwards against the entrance of germs. But if a sterilised water has been subsequently exposed to the air, or mixed with ordinary water, it undergoes the same changes as waters which have not been sterilised; its oxidisable power and its proportion of ammonia decrease, whilst nitrous or nitric acid is formed. If, therefore, the development of organisms in the water is rendered impossible, self-purification is also impossible, the latter process being dependent on the former.

Direct oxidation by atmospheric oxygen certainly does not take place. Ozone and hydrogen peroxide may possibly co-operate in the natural purifying process, but they play in any case a subordinate part.

In connection with the conclusions reached in the foregoing paragraph, the disappearance of the free dissolved oxygen in rivers, where impurities are introduced, must not be forgotten. This disappearance is an analytical fact, and if the missing oxygen has not served directly for the oxidation of the impurities, it must have been transferred to them by the action of the microbia.

The kind of living beings which effect the purification of waters, converting more complicated compounds into simpler ones,—in other words, de-organising or mineralising them,—will differ greatly according to circumstances. Such a change of species has actually been observed in one and the same water-couse in the different stages of its pollution.

It must be remarked that, as far back as 1869, M. Müller instituted experiments on the self-purification of contaminated waters, and pronounced it a vital process. He was

disregarded, however. Now we must regard the entire question of self-purification as removed from the field of pure chemical research.

Even when industrial refuse of various kinds has been allowed to flow into a river, in addition to organic pollution, it has been again and again demonstrated that self-purification can and does take place. But practically speaking we must beware of supposing that the treatment of foul waters should be left to Nature. Where the supply of polluting matter is continuous in time and space, natural purifying agencies fail.

Dr. J. Soyka has almost simultaneously been engaged with a series of experiments on the power of the soil to absorb poisonous substances from the soil, and to destroy them. Solutions of strychnine sulphate, hydrochlorate and acetate of different strengths, were filtered through a cylindrical stratum of gravelly soil, 32 inches in depth, 155 grain measures of the solution being poured on daily. After the soil had received a quantity of the solution corresponding to its capacity for water, the excess drained away, but perfectly free from strychnine. The size of the granules of the gravel had no perceptible influence.

The addition of strychnine solutions was then repeated until the soil was no longer able to retain strychnine. It was then found that the gravelly soil was able to withdraw from solution 0·5 to 0·6 per cent of its weight of a strychnine salt, and 0·4 per cent of its weight of pure strychnine.

A similar result was obtained with quinine, morphine, atropine, pyridine, piperidine hydrochlorate, cinchonine sulphate and hydrochlorate.

It is much to be regretted that the author did not consider it necessary—or perhaps had not the opportunity—to repeat these experiments with any of the ptomaines, bodies much more likely to occur in soils, and whose elimination is, under certain circumstances, of no small sanitary importance.

The more gradually the poisons are incorporated with the soil, the more of them is retained. The soil, however, decomposes the salts which it withdraws from solution. This decomposition takes place quantitatively. The acid reappears in the filtrate, whilst the alkaloid remains in the soil, and for a time unchanged. Both chemical analysis and physiological experimentation prove that it is not decomposed.

The subsequent destiny of the absorbed alkaloids was determined by experiments carried on for some months. When the soil, saturated with the alkaloid, let the solution

pass through unchanged, it was gradually washed out with water. In the filtrate the ammonia and the nitrates were determined, and it was ascertained that, in 167 days, 60 per cent of the nitrogen of strychnine reappears in the filtrate as nitrate, so that in time a complete self-purification of the soil from the poison may be expected.

The first traces of nitrates could be detected in the filtrate at the expiry of eighteen days. If the soil had absorbed quinine a different ultimate product appeared in the filtrate, namely, ammonia. This important difference in the transformation of the alkaloid depends doubtless on the different action of the alkaloids employed upon the nitrifying organisms in the soil.

Peat possesses a greater absorptive power for alkaloids than gravel, but decomposes them much more slowly. If solutions of alkaloids were filtered through charcoal, the filtrate contained large quantities of carbon, even on the third and fourth day after the beginning of the experiment. As the nitrifying organisms had been killed by the ignition of the charcoal, nitrates could not be formed.

These experiments throw little or no definite light on the persistence of non-volatile organic poisons in the animal body after death. We may perhaps, however, venture to assume that as strychnine is decomposed more slowly in peat than in gravel, it will prove not less permanent when existing in the tissues of the animal body.

Other questions may be raised concerning the ultimate result of the disposal of liquid or semi-liquid putrescent matters by irrigation. The experiments described at any rate confirm the conclusion drawn from the soakage of cesspools and grave-yards into wells and streams,—that a given limited quantity of soil cannot absorb and retain an unlimited quantity of organic matter.

An important lesson to be learnt from the researches both of Emich and of Soyka is that the microbia, both of earth and of water, are not necessarily to be regarded as disease-generators. On the contrary, we see that certain kinds of them are converting malignant matter into forms in which it is harmless, or even useful. Hence it is at least possible that, even in the application of disinfectants or "germicides," there is room for discretion.

VI. A GLANCE AT EPPING FOREST.

WE consider it our duty to revisit this rescued territory from time to time with a view of scrutinising its management, and of satisfying ourselves whether it is improving or retrograding. Truthfulness compels us to explain what we mean by improvement or retrogression. The Forest is improving if it becomes, from year to year, a more comfortable refuge for our native flora and fauna. It is retrogressing if it is becoming more monotonous in its features, and if animal and vegetable species once found here are being exterminated or driven away.

Accordingly on the 2nd of July we went to the Forest, in company with a zealous Lepidopterist, and made our approach by way of Chingford. The day was calm and sunny, so that everything wore its most favourable aspect. The first phenomenon which impressed itself upon our senses was utterly loathsome. No person can leave the Chingford Station—whether he ascends the hill to the Forest Hotel, or takes the newly-repaired road to Sewardstone, or, as we did, strikes diagonally over the waste into the Forest—without crossing a most loathsome open sewer. Who is responsible for a nuisance thus thrust into the way of thousands of excursionists we cannot say. Nor do we know why its emanations should be so exceptionally unholy. But there it is, and there it ought not to be.

We crossed the waste land which, though disgorged by the whilome encroachers, has not been, and probably never will be, restored to its natural condition. It has, however, its attractions for "the People." There are swings, merry-go-rounds, shooting galleries, cocoa-nut shies, steam-barrel organs grinding out discords unearthly but not heavenly. Worst of all there are troops of under-fed horses and donkeys, let out by the half or quarter hour to awkward riders, and cudgelled both by their owners and lessees. A truthful "zoophilist"—if such a species exists—would confess that in the outskirts of Epping Forest alone a greater sum of pain is inflicted upon "dumb animals" than in all the physiological laboratories of the world.

But we cannot stop to moralise. On entering the Forest at its lower margin we soon found it very much changed from its aspect only a few years back. Numbers of trees

and vast quantities of bushes had evidently disappeared. Here and there trunks lay prostrate, whilst charred and blackened spots showed where the brushwood had been consumed. Besides all this, deep channels had been cut in the clayey soil, conveying away its moisture to that puerility the "Connaught Water," entirely out of keeping with the general character of the scenery. In consequence the ground, which in this portion of the soil had been naturally damp, and in many spots even somewhat swampy, was now dry. A change had in consequence come over its vegetation, which was, as far as we could judge, becoming less varied and luxuriant. The way in which the axe and the bill-hook had been used had also effected a great change. Formerly a prominent feature of this region of the Forest was glades of an irregular shape, 5, 10, or perhaps in some cases 20 yards across, walled in with dense masses of shrubs, such as sloe, whitethorn, and wild roses. These glades, screened from every wind and guarded against the desiccation of the soil, were the favourite haunts of butterflies, moths, bees, and other insects. Now we do not feel free to say that none of these retreats are left, but they are certainly far less numerous than formerly. The mounds of vegetation, which screened them from chilly winds and from drought, have been broken down, and they are rendered comparatively bleak and arid,—a kind of "Conservation" which the insects and the birds evidently do not appreciate. The lower edge of this region was once a favourite haunt of the viper and of the grass-snake; but on the day in question no trace of either of these reptiles was perceptible. Our friend was much struck with the obvious scarcity even of the commoner kinds of butterflies.

One moth, indeed, the green Oak-Tortrix, was but too common. It was dancing among the topmost branches of the trees, and descended in perfect showers if a bough was shaken or struck. The damage, which had evidently been wrought by these little creatures whilst in the condition of larvæ, was amazing, the leafage of the oaks looking quite shrivelled up. For this pest neither the Conservators, nor the "experienced Forester" (their adviser), nor even H.R.H. the Ranger, had found any remedy.

A curious fact is that numbers of these moths were sitting on the smooth trunks and branches of the trees, where their bright green upper wings made them quite conspicuous even at a distance of 6 to 8 yards. This is certainly not a case of "protective colouration." Many species of insects seem

to select resting-places agreeing closely in colour with themselves, and thus escape the notice of their enemies; but this Tortrix seemed almost to court observation. Especially a vast number of pairs *in copula* had selected such exposed situations. Can it be that this species is so far secured against extinction by its fearful fecundity that it has not acquired the usual protective instincts?

As we went on and on, one point at least became evident: the Conservators were doing no further mischief. No workmen were to be seen; no more trees were being felled, and no more draining operations were being conducted. But this is small consolation. The question is how the mischief is to be undone? The bushes will, if unmolested, gradually grow up again and shut out the wind; but Nature, we fear, without active assistance, will be powerless to block up the drains and to retain in the Forest the moisture which now goes to feed the "Connaught Water." And we do not see how the "Conservators" can be brought so far to reverse their policy and own themselves in the wrong.

Crossing the Epping Road, and visiting the high grounds in the extreme north-eastern part of the Forest, we found that the old gravel-pits had been filled up and levelled. Now a recent gravel-pit is no very attractive object; but when it has become old, when its bottom is a pool,—the haunt of water-plants and aquatic insects and molluscs,—and when its sides are covered with straggling vegetation, it becomes precious to the naturalist. We greatly fear that, as far at least as this locality is concerned, entire species have been exterminated by the levelling operations, the filling up of the gravel-pits in this part of the Forest. We saw, for instance, not a single tiger-beetle. And if we remember that the slopes of these pits were the chief spots where the larvæ of this insect burrowed, we may well suppose that such a burial must prove fatal. Similar will have been the fate of various fossorial Hymenoptera.

In the same section of the Forest, but at a much lower level and nearer the Epping Road, was formerly a rushy spot, which in wet seasons was partially under water, and in the driest weather remained decidedly moist. Formerly this spot was a centre of attraction for butterflies, just as is the "Robin Hood" for human visitors to the Forest. But we found this once marshy patch dry, and not a single butterfly was hovering over it. Hence we fear that here, too, some draining operation has been carried on, though

we scarcely see that the waters of this region can have been conveyed to that costly blunder the "Connaught Water."

In short, we cannot help concluding that the forebodings of our contributor, Frank Fernseed, expressed in June, 1882, have been in great part fulfilled. Very much has been done to convert Epping from a Forest to a Park. Formality and monotony have been inaugurated in place of freedom and variety. For a park—be it a peer's or a people's—is something essentially formal and monotonous, and we hoped that in Epping Forest the public would have had something very different. We should have felt little satisfaction had we known in what manner it was to be "conserved."

VII. THE NEEDLE ORDEAL IN WITCHCRAFT: NON-SENSITIVE POINTS OF THE SKIN.

WHILST it is well known that we perceive with the eye merely visual sensations, and with the ear only sounds, it is admitted that with what is commonly known as the sense of feeling we perceive an entire series of respectively heterogeneous sensations, for with it we recognise heat and its opposite cold, pressure, pain, &c. There can be no occasion to point out that these different sensations occasionally overlap each other. Thus temperatures differing too widely from the average condition of the medium in which we live occasion us pain; but any and every temperature, or change of temperature, is not necessarily recognised as pain or as its opposite. Certain degrees or modifications of pressure are felt as pain, but we cannot pronounce pressure and pain as one and the same thing.

In Physiology the view is commonly received, on the ground of observations and experiments on the organs of the senses, that each nerve can conduct only one specific kind of sensation and convey it to the central organ. Hence arose the problem for Physiology, either to show that there

exist in fact, in the skin, special nerves for the different qualities of sensations, or to reject the law above cited as not universally applicable. It has been demonstrated by recent experiments that in fact, for some at least of the sensations mediated by the nerves of the skin, there exist especial terminal apparatus, and therefore probably especial conductions to the nervous centres.

Researches in this direction have been conducted by Herr Blix. More recently Dr. Goldscheider has independently examined this question, and has communicated his results in a memoir read before the Physiological Society of Berlin, and to the "Naturforscher." His investigation was conducted with a solid cylinder of brass, terminating in a rounded point. This instrument can be heated or cooled at pleasure, and is in connection with a writing-pencil. If the sensitive points are marked with colours, we can convince ourselves that only certain points of the skin are capable of recognising temperatures. Further, those which perceive cold (the cold-points) are separate from those which perceive heat (the heat-points). We presume that by cold and heat the author must mean temperatures respectively colder or hotter than that of the human body. On examining more closely the distribution of these points, it appears that they are arranged in chains which radiate out from certain points of the skin, and take generally a more or less curvilinear course. The chains of cold-points are mostly distinct from those of heat-points, but there occur occasionally mixed chains of both kinds of points. In the hairy parts of the body these chains radiate, with a striking regularity, from the hairs. In the hairless parts the arrangement is similar; there are radiating points at similar distances, as in the hairy parts. The prominent signification of the hair-places for the temperature-sense is visible in those regions which contain few temperature-points. Here it occurs that such points are found only at the hairs, whilst between them is everywhere insensibility against temperature.

The temperature-points are anatomically constant; for such points when they have been marked on the skin can be recognised as such, on a renewed examination, a long time afterwards. They may even be recognised after the removal of the epidermis, and they have consequently nothing in common with its thermic conductivity. The heat-points are everywhere less numerous than the cold-points. The number of the temperature-points altogether varies locally, and falls distinctly into the back-ground in those surfaces of

the skin which subserve the sense of touch. The feeling which arises on irritating a temperature-point differs in strength at different points, and these require for their excitement a different degree of irritation.

A noteworthy property of the temperature-points is that a sensation of temperature can be induced in them by a gentle thrust with a needle or a pointed splinter of wood. It appears therefore that the temperature-point is a very well-defined anatomical point, since the sensation of temperature ensues only when the point is most accurately hit. In like manner the feeling of temperature proper to these points can be excited by means of induction-currents. On the other hand, it is found that the temperature-points recognise neither contact nor pain. The latter phenomenon is very distinctly demonstrated by means of a fine needle which is plunged vertically into the skin. Here also is to be noted the sharp limitation of the temperature-point.

If there are special nerves for the recognition of temperature, we must naturally expect that they will, so to speak, translate every sensation into the language of temperature, just as a blow on the eye is perceived as a flash of light, and pressure on the nerves of hearing is felt as a humming noise.

The fact that the temperature-points are insensible to pain reminds us of one of the traditions of witchcraft. Among the methods of recognising a witch it was customary to thrust pins or needles into different parts of the body. Witches, it was thought, had certain spots insensible to pain, and if the prick of a needle in any part was not felt the victim was at once condemned. In virtue of Dr. Goldscheider's researches we may say that these non-sensitive spots were simply the temperature-points, and that they would be found in all persons alike.

These experimental results permit the conclusion that the temperature-points present gaps in the sensitive field of the surface of the skin, filled up, on the one hand, with specific cold-nerves, and on the other with heat-nerves. Thus, as far as the nerves of temperature are concerned, the doctrine promulgated by Prof. von Helmholtz, that every nerve-fibre is capable of one only state of excitement, and consequently of only one quality of sensation, is fully confirmed. This view is further confirmed by the fact that Dr. Goldscheider has succeeded, by electrising the nerve-stems, in exciting very distinct peripheric sensations in the region of the nerves concerned,—the feeling of cold predominating. The

same result has been obtained in some parts by pressure upon the nerve-stems.

In these topographic investigations it has been found that the heat-sense is less developed than the cold-sense, both in extent and in intensity. The temperature-points possess an exceedingly fine sense of locality. If two of them are irritated simultaneously, individual pairs of points can be recognised as twofold at very small distances, even to less than 1 millimetre. Such minimal distances differentiate topographically.

On the analogous application of pressure to certain points, certain such points of the skin have been found especially sensitive to pressure. The investigation was effected by means of an instrument consisting of a spiral spring supporting a needle, in which was fixed a small plate of cork, as well as a pencil to identify the points. These points can also be found by means of weak induction-currents. These points are not alone prominently sensitive to slight mechanical irritation, but they are at the same time the seat of a specific feeling for pressure; hence they may be characterised as pressure-points. This specific feeling is distinguished from that of the intervening skin by the distinct, acute, sensation of point-pressure; by the direct appreciation of the gradations of pressure; by the painfulness of strong irritation; and lastly, by means of their very distinct sense of locality. By means of a pair of compasses it was ascertained that adjacent points of pressure were felt as double, even at such small distances as 0·1 millimetre.

The pressure-points display the same type of arrangement as the temperature-points, but they generally stand much more closely together. They likewise are arranged in chains which radiate out from certain points, and quite especially from the hairs. At these parts there is often an agglomeration of pressure-points, and in parts which are little sensitive to pressure the immediate vicinities of the hairs alone possess pressure-points. In hairless places there are corresponding symptoms of radiation which in position correspond with those of the temperature-points. As regards their sense of locality, the remarkable phenomenon has been observed that pairs of points belonging to different chains have, in general, a more strongly developed sense of locality than those belonging to one and the same chain. This admits of the inference that the points belonging to one chain are in more intimate anatomical connection than those of different chains.

We see therefore that the skin contains, distributed over its surface, organs of at least two distinct kinds, each having its special inservation and its conduction to the nervous centres. We see, on the one hand, temperature-points, sensitive to heat or cold, but insensible to pressure or pain, and so specialised that heat and cold fall under the cognisance of distinct organs; on the other hand, we see pressure-points, very sensitive to pain and to pressure, but insensible to temperature.

VIII. FLOWERS AND INSECTS.

THE mutual relations of flowers and insects have given rise to no little ink-shed. They have been seriously studied by naturalists of merit—to mention names would here be invidious. They have been made the subject of smart "readable" gossip by *dilettanti*, and they have been altogether denied by certain "survivals." But since the death of Hermann Müller too little has been added to our solid knowledge on this most interesting subject. The reason why so little has recently been done in a region far from exhausted has been ascribed, on the one hand, to the difficulties of the statistical method, as used by Müller, and, on the other, to the circumstance that a combination of entomological and of botanical knowledge is here required. The observer must not merely be able to identify the flowers visited and the insects which frequent them, but he must be acquainted with the morphology of the one and the other, so that he may comprehend their mutual adaptations and the part their inter-relations have played in the evolution of varieties and species. Such a double acquaintance with flowers and insects by no means falls to the lot of every naturalist.

We may therefore congratulate ourselves that the question has been taken up anew by Prof. E. Löw. This investigator proceeds from a different point of view to that adopted by the late Hermann Müller, and has reached some exceedingly important results, which have been consigned to the pages

of the "Jahrbuch des Botanischen Gartens, Berlin," and of the "Naturforscher."

Prof. Löw takes up in particular two questions: he examines the relation between the circle of visitants and the selection of flowers visited in a definite area of observation, whose constituents are heterogeneous, being accidentally made up of plants of very different origins. Secondly, he examines what colours, under otherwise identical circumstances, are preferred by the insect visitants. The field of observation was the Berlin Botanical Garden: 205 species of insects were noticed as visiting flowers,—namely, 102 Hymenoptera, 66 Diptera, 22 Coleoptera, 13 Lepidoptera, and 2 Hemiptera. This is about one-fourth of the species which Müller, in his work on the fecundation of flowers, mentions as flower-frequenters. We may here notice as somewhat extraordinary the paucity of butterflies and moths, especially as Germany is far richer in these insects than Britain. It is very probable, judging from our own observations, that if a plot of ground had been selected some 10 or 20 miles from any large town the proportion of Lepidoptera would have been greater.

Prof. Löw observed 2000 insect visits to 578 species of plants cultivated in the open air. The plants in question belonged to three distinct zones. The first zone comprised plants of the forest-territory of Europe and Asia. In the second group were included all plants of the Mediterranean region, and of Western Asia, a region whose insect fauna differs from that of Central Europe and Asia more widely than do the various parts of the Central European and Asiatic region from each other. The third zone comprised plants indigenous in America or Eastern Asia, whose homes have an insect fauna still more widely differing from that of Central Europe. Plants of other origins were not taken into consideration.

It is well known that Müller seeks to answer the question, what species of insects are especially active as pollen-distributors in a given kind of plant. Löw takes up the inverse question: what selection does each insect species make among the flower-forms and colours presented to its view? Such an examination of the subject from the entomological side was necessary, as only thus can a clear insight into the abundance of the facts be obtained.

In accordance with this principle Löw has arranged his materials not according to plant-species, but to insects. Hitherto only the first part of his researches has been made public,—that treating of the Apidæ. Of these he has ob-

served 20 genera, with 77 species. The single genera and species are characterised by their distinctive features, and especially by those structural features which come into play in the collection of pollen and honey, and brought into connection with their activity in different forms of flowers. In connection therewith there is given for each species a list of its flower-visits founded on Müller's arrangement of flowers, —as wind-flowers (anemophilous), pollen-flowers, flowers with their honey open, partially concealed, or fully concealed, flower associations, fly-, bee-, and butterfly-flowers.

First in the series of flower-visitants ranks the hive-bee, *Apis mellifica*. Its trunk, neither too long nor too short, affords the best conceivable equipment, by the aid of which it surpasses all its rivals in the number of flowers which it can utilise. It is the most skilful of all flower-visitants, being able not merely to distinguish the exceedingly manifold arrangements of flowers, but to utilise them most advantageously by modifying its procedures. Of the flower-visits observed by Müller in Northern and Central Germany, 36·3 per thousand were effected by the honey-bee. Löw's observations give a proportion three times greater,—a result due to the peculiar locality.

Nevertheless, as regards the selection of flowers, there is little difference between these two authorities. Müller's observation, that any class of flowers is visited the more rarely the opener its store of honey, was fully confirmed. These and other facts prove that all doubts as to the trustworthiness of the statistical method must be considered unfounded.

An especially striking fact established by Löw is, that of the nine kinds of *Bombus* which he has observed, and which may be arranged according to the length of their trunks in an ascending series from *Bombus terrestris* to *B. hortorum*, show a similarly progressive preference for "bee-flowers."

The following facts, advanced by Müller in support of his theory of flowers, have been fully confirmed by Löw in his limited field of observation:—

1. The more openly a class of flowers presents its honey the more it is visited by species with short trunks; the more deeply the honey is concealed the more it is frequented by visitors with long trunks.
2. The more a flower-visitant is furnished with a short or a long trunk, the more decidedly it prefers flowers with open, or respectively with deeply-concealed, honey. In visitants with long trunks, however, in

case of an increased demand for nourishment (as in hive-bees and hummle-bees*), a more or less general utilisation of flowers whose honey lies exposed is observed.

3. Visitors with short trunks prefer flowers of light colours,—white or yellow. Species with long trunks prefer dark-coloured flowers,—blue, red, violet. Species very eager for food visit a more promiscuous circle of colours.

To these propositions may be added a fourth, which, though rendered probable by Müller, was not demonstrated, —that a disharmony between the adaptation of flowers and the sphere of action of the agents in crossing may appear if the circle of visitors is subsequently modified, *i.e.*, by the distribution of plants in a new territory. Löw observed that the species of *Apis* flying in the Botanical Garden made a different selection among exotic flowers from amongst native species. They select, indeed, the classes of flowers of the Mediterranean plants in the same serial order as those of Central Europe, but their preference for "bee and hummle flowers"—consequently for flowers with dark colours—is increased about 20 per cent. Very different is the proportion among American species. Here the light-coloured flower associations seem to attract bees most strongly. This behaviour may be explained by the circumstance that among the North American plants cultivated in the Botanical Gardens the yellow Compositæ predominate, whilst among the Mediterranean species "bee and hummle flowers" are most numerous.

An important result of these researches is that the selection of flowers and of colours is not, as Müller supposed, determined absolutely by the length of the trunk. This is proved by the fact that different Apidæ, with trunks of equal length, make a quite different selection. Löw terms this phenomenon *heterotropism*. He terms species which give an exclusive preference to certain flowers *oligotropic*, and those which proceed otherwise *polytropic*. The most distinctly oligotropic species is *Anthidium manicatum*, and the most polytropic is *Apis mellifica*.

In almost all genera of bees there can be shown a factor which, in conjunction with the length of the trunk, determines the peculiar selection of flowers. As such may be

* The *b* commonly figuring in humble bee is an error. The *h* also is rightly aspirated, as the word has no connection with *humilis*.

mentioned the early or late time of flying (*Osmia rufa*, *Anthophora pilipes*); an increased demand for nourishment (*Apis*, *Bombus*); great demand for pollen (*Heriades truncorum*, *Prosopis*); peculiarities of the structure of the nest (*Anthidium manicatum*, which has a short trunk, lines its nest with the woolly hairs of leaves, and consequently prefers the hairy Labiatæ to the Papilionaceæ, though it could obtain honey much more conveniently from the latter).

Müller recognised to some extent the influence of such factors, yet he laid far too little weight upon them, though their importance can be shown from his own statistical results. It appears therefore inadmissible to found the progressive development of flowers and insects solely upon the elongation of the trunk. In this respect Müller's theory is in need of modification.

ANALYSES OF BOOKS.

Spectrum Analysis in its Application to Terrestrial Substances, and the Physical Constitution of the Heavenly Bodies. Familarly explained by the late Dr. H. SCHELLEN. Translated from the third enlarged and revised German edition, by JANE and CAROLINE LASSELL. Edited, with Notes, by Captain W. DE W. ABNEY, F.R.S. Second Edition. London: Longmans, Green, and Co.

A WORK on Spectrum Analysis may be either devoted to a description of the various forms of the spectroscope, and the precautions to be observed to ensure success in their employment, or it may discuss the results obtained in various sciences by the use of this instrument. The volume before us to a certain extent combines both these features. At least to a very full explanation of the fundamental principles upon which spectrum analysis is founded, and to an account of most of the existing types of the spectroscope, it adds an elaborate exposition of our present knowledge in what may be termed celestial chemistry. On the contrary, the reader who seeks for information on the use of the spectroscope in organic chemistry, or in biology, will find comparatively little to suit his purpose. As an important feature—not to be found in many physical treatises—may be noted, with approval, the very sparing use made of mathematical formulæ. Too many writers on such subjects, we fear, instead of using such formulæ merely where and in so far as it may be necessary for explanation, invert the matter. They seek to make phenomena merely a peg on which to hang a maximum of mathematical discussion. By so doing they succeed to a marvel in making themselves unintelligible to all save specialists.

The present work is divided into eight parts. The first part discusses the artificial sources of high degrees of light and heat, such as the Bunsen burner, the electric spark, the voltaic arc, &c. The second bears the heading "Spectrum Analysis in its Application to Terrestrial Substances." But it includes also the theory of light, an account of refraction of the solar spectrum, and of the dispersion of light. It would be needless to enumerate the different kinds of spectroscopes which are here described and figured. Only eight pages are devoted to the absorption of light by liquids, and the micro-spectroscope is treated much more briefly than in Mr. Suffolk's little work.

The remaining five parts or chapters, forming the larger portion of the book, deal with celestial spectroscopy. Here, however, there are also included sections on telescopic appearance of the sun's surface, and speculations as to the nature of the solar spots founded upon telescopic observation.

Here, therefore, we are landed on what is somewhat profanely called "sunspottery." The history of opinion on these much begossipped phenomena is briefly given. Pastor Schülen, of Essingen, in 1770, is said to have been the first who pronounced these spots to be depressions. The same view was held by A. Wilson and the elder Herschel, and, though we find it stated in the text that "opinions are still divided as to whether the spots are cavities or not," yet the Editor appends a note which seems to answer the question in the affirmative:—"At Kew and Greenwich photographs have been obtained when a spot was just at the limb. One or two photographs show notches cut out of the limb due to the depression of the spot." The conflicting theories of Spörer and Zöllner, on the one hand, and of Secchi on the other, concerning the causes of the spots, are summarised, but no positive conclusion is drawn,—a judicious reservation. The question which is most closely linked with sun-spots in the public mind,—*i.e.*, the connection, real or supposed, of their periodicity with a variety of terrestrial phenomena,—lies, strictly speaking, outside the plan of the present work, and is therefore not entered upon. On this subject we may refer to a brief note in our "Correspondence" department.

The succeeding chapters treat of the applications of spectrum analysis to the moon and planets, to the fixed stars, the nebulæ and clusters, comets and meteors, the zodiacal light, aurora borealis, and lightning.

The value of this work to all who are interested in celestial phenomena—and who is not?—is incontestable. On this part of the subject it may claim an almost encyclopædic position. The illustrations are excellent and very numerous. There are fourteen maps and plates, five of which are coloured, and 604 woodcuts introduced along with the text.

The Wave of Translation in the Oceans of Water, Air, and Ether. By J. Scott Russell, F.R.SS. L. and E. London: Trübner and Co.

The author of this work divides water-waves into four orders. The first is the wave of translation, the second oscillating waves, the third capillary waves, and the fourth the corpuscular wave. As instances of the first order he mentions the tide-wave and the

aërial sound-wave; of the second, wind-waves and the ocean swell; of the third, dentate waves and zephyral waves; of the fourth, the water-sound wave. He considers that an intimate acquaintance with the nature and the laws of the wave of translation will "in the future render great service to researches in physical and chemical science." He applies his knowledge of this wave primarily to the doctrine of sound. He considers that the phrases "waves of sound," "oscillations of air," &c., are used too generally and vaguely, and applied in a misleading manner. His own view is that each separate sound has one solitary wave of its own, which goes out from the source of sound along one straight line in a given direction, carries the impulse it receives, from whatever source, with a given velocity, and delivers into the ear the single impulse it receives. It is thus one single complete phenomenon."

Incidentally and mainly, as an illustration, he points out that if the contents of an elevated reservoir are suddenly and at once discharged into a canal, they will do at the other end of that canal far more work than if permitted to flow in slowly. In the former case there is no loss or waste of power except the small waste by friction. In the latter case nearly the whole of the useful power is wasted. This is a consideration of importance.

In Part III. the author treats of the "Great Ocean of Ether and its Relation to Matter." Here we find some questionable chemistry. Mr. Russell writes:—"The air we breathe is oxygen and nitrogen. The nitrogen we breathe out finds its way into the plants which want to take it in." But the nitrogen we breathe out, like that of the atmosphere which has never passed through our lungs, is incapable of being absorbed and assimilated by plants. The author continues:—"All trees and vegetables are almost entirely made up of these four elements, hydrogen, oxygen, carbon, and nitrogen, and, to convert these into the matter of which all animals are made, we take the elements of that same vegetable matter, and add to them a small quantity of one or more of the sixty other substances which, as far as we know, comprehend the whole universe." This passage seems to convey the erroneous view that animals and plants differ qualitatively in a chemical point of view.

We regret that the space at our disposal does not permit us to carry any further our examination of this work.

The Revival of British Industries the most Important Question at the approaching General Election. By A CANDIDATE. London: James Bolton.

THIS pamphlet does not fall within our legitimate purview.

Scientific Romances, No. II. *The Persian King, or the Law of the Valley.* By C. H. HINTON, B.A. London: Swan, Sonsenschein, and Co.

SOME time ago we had the pleasure of noticing the first of these "Scientific Romances" from the pen of Mr. Hinton. Concerning the purport of that treatise not the slightest doubt could exist. Some persons might be led by its reasonings to an acceptance—transitory or persistent—of the conception of space and matter as four-dimensional or even *n*-dimensional. Others might doubtless throw it aside as an idle though ingenious paradox. But all alike would see, at least, what the author was seeking to prove. But in the work now before us the case is very different. There is no one interpretion of the allegory which will force itself upon all readers as the only one possible. One interpreter may say that the author is combatting the notion of energy running down and of the universe being gradually resolved into a *caput mortuum*, as the old alchemists would have called. Another, basing on p. 127, lines 1 to 4, may see here an assertion of "substantialism" of the existence of imponderables. A third fixing his attention on the lower part of the same page, and on certain corroborative passages elsewhere, might contend that Mr. Hinton's main object was to explain the Divine action in the government of the universe.

Yet another plausible interpretation is that the author is expounding the relations of pleasure and pain, arguing that just as action and reaction are equal and opposite, and that as a semi-oscillation of the pendulum pre-supposes the other half, so every pleasure felt in the universe involves a certain corresponding amount of pain in the same sentient being or in some other. This might, perhaps, be expanded into a theory of one of the mysteries of the world, vicarious suffering. But if pleasure necessitates pain, pain must also necessitate pleasure. If we bear pain, or inflict it upon ourselves, do we give a corresponding amount of pleasure to some being? If so, we have a philosophy of asceticism. But if we inflict pain upon some one being, A, do we not in like manner then occasion pleasure to some other being, B? Singularly enough the ascetic or self-tormentor is, we believe, without exception, the first to torment others.

But leaving such rambling speculations, let us ask whether pleasure and pain are of necessity equal and opposite, lying, like the semi-oscillations of a pendulum on opposite sides of some neutral or zero point? We think not universally so. For pain is often merely the intensification of a feeling which in lower degrees is pleasure. If we suffer from cold we hold our hands or feet to the fire, and we feel pleasure in so doing. But if we hold them gradually nearer and nearer, or if the fire is urged to a fiercer heat, we find the pleasure gradually passes into pain,

Pleasure and pain, then, in some cases at least, lie on one and the same side of the zero-point. There are further, many parts of our bodies very capable of experiencing pain, but quite incapable of pleasure. When working in their optimum condition under normal circumstances we are not conscious of their existence. On one side of the zero-point there is, to our knowledge, nothing. Further, as far as we are capable of tracing, the intensity of pain is far greater than the utmost intensity of pleasure. What pleasure is as great a departure from the zero-point on the one side as is violent neuralgia on the other? But very possibly we are questioning propositions which Mr. Hinton does not affirm.

He writes—"Does this will not exist in those who are true personalities, and not mere pleasure-led creatures?—have they not some of this power, the power of accepting, suffering, of determining absolutely what shall be?—a creative power, which given to each who possesses it, makes him a true personality, distinct, and not to be merged in any other—a power which determines the chain of mechanical actions, of material sequences—which creates it in the very same way in which it seems to be coming to an end—by that which represented in material terms is the absorption of energy into an ultimate medium, which represented in terms of sensation is suffering, but which in itself is absolute being, though only to be known by us as a negation of negations."

Cremation. By J. G. Davey, M.D. Read at Meeting of Bristol Medico-Chirurgical Society. Reprinted from the "Bristol Medico-Chirurgical Journal."

The author of this pamphlet remarks that in our great cities at least the disposal of the bodies of the dead is becoming, or is already, one of the most pressing questions of the day. The great work which Dr. George Walker—familiarly known as "Churchyard Walker"—began and carried through near forty years ago is to do over again. What the old urban grave-yards were then the suburban cemeteries are now, or are fast becoming. They are being surrounded by the habitations of the living, their drainage soaks into the earth and saturates it with the products of putrefaction and with disease-germs, or finding its way into the sewers it sends off volatile matter, which, through sinks, baths, and water-closets, find access to our houses. Unfortunately, too, many of our cemeteries have been placed, as if for this very purpose, upon eminences. We find here mention of a fact of which the public are certainly not aware. Speaking of the cemeteries at Highgate, Kensal Green, and Brompton the author says:—

"These burial-places, it should be known, were condemned in 1850, by the Board of Health, and ordered to be closed, in the interest of the public health, but to this day they remain *unclosed*. The last-named cemetery was bought by Parliament, yet the Government of the country is now using it 'at high pressure and remunerative rates,' though 'condemned' by its own Board a generation since!"

We must here pause to make a remark. An offensive and dangerous grave-yard, it appears, has privileges unlike any other nuisance. Take an ill-managed manure-works, or a sewage-polluted river. The owners or other parties occasioning the nuisance receive at once peremptory orders to discontinue or abate the same, and are liable day by day to a penalty until the evil complained is removed. If this is not feasible the works may be stopped altogether, no matter at what loss to the owners. Nay, we have heard of a case where a verdict of manslaughter was duly returned against the proprietor of a manure-works, it having been shown that certain deaths had been at least accelerated by the fumes given off. But we believe that when a grave-yard or a cemetery is found to be a nuisance, and is closed accordingly, its owners, so far from being liable to any penalties for past mischief are considered entitled to "compensation." This is one of those pieces of inconsistency in which John Bull delights.

We are glad to find that in this pamphlet Dr. Davey, unlike the bulk of modern sanitary authorities, distinctly admits the merit of G. Walker as the reformer of our grave-yards,—a merit too often ascribed to others, who shine, if at all, merely by reflected light. But a quite different reform is now necessary. If the dead are to be carried out to such a distance that the cemeteries shall be in no danger of being surrounded by houses, the cost of funerals, already a heavy burden for all but the wealthy, will be greatly increased. One escape, and one only, is open. In the words of the Rev. H. R. Haweis here quoted—"The pure fire-angel of cremation stands now at the door." It is proved that the microbia of infectious diseases are not destroyed by burial. They multiply in the putrescent corpse, and the earth-worms, as it has been distinctly shown in Pasteur's experiments, bring them up to the surface. When once there the flies, *colporteurs* of fever and pestilence, do the rest.

We are far from asserting that cremation is without its difficulties. But in the three weightiest points, public health, economy of land, and decrease of funeral expenses, its advantages are indisputable.

Our Corner. Vol. VI. No. 1, July 1, and No. 2, August 1, 1885. London: Freethought Publishing Company.

THESE two issues are, in our opinion at least, much more interesting than the generality of their predecessors. Or, to say the same thing in other words, they are less exclusively political.

The papers by Mrs. Besant on the "Evolution of Society" contain many truths which, if not always novel, need repeating with ever increasing emphasis so long as they pass unnoticed. The author shows that our modern industrial organisation is not in all respects an improvement. She writes:—"In consequence of the slight division of labour there was a pride in capable workmanship which is now almost impossible. Individual ability, under this system, was at once apparent and had scope for development, so that art and industry were more closely united than they have ever been since. The artist (*e.g.*, Benvenuto Cellini) was largely a handicraftsman in the industrial sense, and the handicraftsman was largely an artist (sometimes the one was transformed into the other, as in case of Quentin Matseys), and side by side with this mental development existed physical vigour in consequence of the small size of the towns and the accessibility of the open country." Who dares deny all this?

The writer shows that the result of machinery "should have been wide-spread comfort and a great diminution of the hours of labour; the result of it has been the accumulation of vast fortunes by a comparatively few, the deadening and the brutalising of crowds of the handworkers. Whether we regard the immediate or the general results we shall find them very different from the rosy hopes of those who gave to the world the outcome of their inventive genius." These truths are expounded with much ability and with a wealth of illustration. But why has machinery been put to the wrong use? Simply from human greed. Instead of producing the same quantity of goods as before in less time, men preferred simply to increase production. It has been said that machines are like slaves, and the resemblance goes further than was supposed. In the Carolinas, besides the slave-owner and the slave, there was merely the "mean white," and the tendency of machinery as now applied is to reduce all who are neither capitalists nor "hands" to the position of "mean whites." Sanitary reform is strenuously insisted on. It is urged that "a high human type cannot be bred in a slum, trained amid filth and ugliness and clangour, sent to labour ere maturity. . . On the faces of the lads and lasses who come tumbling out of factories and warehouses at the close of every day, filling the streets with tumult and horseplay, is set the seal of the sordid conditions under which they live." We could say more on this subject did our allotted space allow us.

"The Population of a Peepul-tree," by C. Bingham, is a sound, original study in Natural History. The author evidently resides

in Burma, where there is much to be seen not yet recorded. He notices *Ficus laccifera* as yielding caoutchouc quite as good as that of *Ficus elastica*, but strangely overlooked. The tenacity of life of the *Ficus* genus and their power of destroying other trees and even buildings are ably and correctly described. The account of the Bahalias catching birds on trees with rods smeared with bird-lime is decidedly painful. The author remarks that "paroquets, notwithstanding their large brains, are foolish fowl after all." Continuing his notes in animal psychology he tells us that "*Semnopithecus cristatus* is far inferior in intelligence to the common fishing monkey (*Macacus cynomulgus*), and this is strange, for the skull of *Semnopithecus* has a far better shape, and is not nearly so retreating, as that of the *Macacus*."

The peepul-tree was, we are told, simply alive with birds. The tailor bird (*Orthotomus sutorius*) has profited by civilisation. As is well known it sews leaves to form its nest. In gardens it often discards the rough fibres produced in the jungle, and uses cotton thread stolen from the house. The thread is knotted at one end, passed through both leaves, drawn tight, knotted again, and the remainder cut off.

Butterflies in numbers were attracted apparently by the heavy odour of the peepul fruit.

The fire-ants, *Formica smaragdina*, notwithstanding their ferocity, are preyed upon by a *Mantis*, which mimics them so closely that it is able to approach a stray ant without being detected until too late.

Two mud-building solitary wasps, one red-brown and the other a deep blue, are a pest in Burma from their habit of stopping key-holes with their clay nests. One of these nests of three cells was seen to be built and provisioned in 2 hours 7 minutes. We hope we have not heard the last of Mr. Charles Bingham.

Mr. J. Horner contributes two sound articles on "Work for the Microscope," in one of which he treats in a very practical manner on the collection of specimens which may serve as objects.

Mr. John Robertson is the author of two papers of singular ability. The first of these, "Concerning Ritual," we were about to pass over as not coming within our scope. We found, however, that he raises the weighty question whether in these days man is becoming more or less differentiated? Whether individuality is waxing or, as Stuart Mill contended, waning? Mr. Robertson rejects the view of Mill, and in some respects he is right. But he omits one factor which tends to increase monotony in character: the examinational tendency of modern English education. It is somewhat singular that none of the organs of Freethought, as far as we are aware, ever raises a protest against this bureaucratic system.

The article winds up with a scathing exposure of positivism. Mr. Robertson writes:—"An enthusiastic system-maker pro-

poses to undermine once for all the dominion of supernatural religion by teaching men that humanity should be the object of his devotion rather than God. And how does he think to work out his purpose? By giving men a code ordering for one and all their whole lives, and fixedly ordaining alike the time to be given daily to the ritual of the new religion and the distribution of that time in detail. Setting out with the avowed object of cultivating devotion to humanity, Comte assumes that men cannot stay in the right attitude unless they keep constantly repeating formulæ; praying at fixed hours and distributing their prayers in fixed arithmetical proportions; reverencing mother, wife, and daughter, *in the abstract*, so many hours by the dial; doing honour to particular men on particular days all the year round; taking their poetry and music by the calender: and this not according to their own choice, but comformably to a table drawn up for their use—turning themselves into something like the praying-wheels of the monks of Thibet. This, forsooth, is the way to make men free and wise and self-controlled,—this paralysing of every spontaneous emotion, this tabu of all originality, this elaborate extirpation of the faculty of individual judgment! . . It is the very mania of pedantry, the very insanity of formalism."

Mr. Robertson's second article, "The Ethics of Vivisection," is far too important to be noticed at the conclusion of a slight critique like the present. If possible it will be made the subject of an article in our October number.

Once a Month: A Magazine for Australasia. Vol. II., No. 6. Melbourne and Dunedin: Inglis and Co. London: Griffith, Farran, and Co.

THERE is much in this magazine upon which we are not at all competent to pass an opinion. "Sounds and Sandflies" is an interesting survey of a beautiful region on the west coast of New Zealand, endowed with charms innumerable, but cursed with the multitudinous presence of one of the most offensive forms of man's eternal enemy—the Diptera. Sandflies generally—why so named we know no more than the writer of the paper before us, since they are by no means confined to sand—are of all Diptera the most detestable. Their European representative (*Simulium Columbaczense or Rhagio Columbaczensis*) of southern Hungary is a fearful scourge alike to man and beast, but from the description here given of the New Zealand species it is certainly not less to be dreaded. Various remedies or preventives seem to

have been used by the party whose adventures are here described, but all it would seem unsuccessfully. Amongst them is mention of a tincture of rosemary. The question suggests itself, was this garden-rosemary, or the very different plant marsh-rosemary (*Ledum Palustre*)? From personal observation we know that the tincture of the latter plant is a protection against mosquitoes, and we shall be much disappointed if it fails as against the New Zealand sandfly. We see no mention of the tincture of *Pyrethrum roseum* having been applied.

It is much to be regretted that so few inventors turn their attention to means of repelling or destroying the blood-sucking Diptera. It is not too much to say that over three-fourths of the habitable globe human life is more or less embittered by these pests.

The origin of their blood-sucking instinct is an uncracked "nux zoologica." Here are creatures not dependent upon human or mammalian blood. Indeed, millions of them and of their progenitors for generations must in such localities as the Western Sounds of New Zealand never have seen or smelt a mammal. Yet on the very first approach of a man they flock to him as if blood was a necessary to which they had always been accustomed! Their supposed sanitary services are so far from being established that the very contrary view is almost absolutely demonstrated,—that they are the *colporteurs* of zymotic disease. Surely in view of what we know of the *Culicidæ* and *Tipulidæ* the "pious adage" that everything is of some use becomes very questionable.

In "Adventures of a Pioneer" there is mention of a tree called "the native Peruvian bark tree." The bark is said to contain a large proportion of quinine. Whether this tree is near of kin to the Cinchonaceæ it does not appear. We read further some particulars of a beautiful tree which has been named in honour of Professor Owen. It appears that it propagates only by suckers which spring up from the roots. The seeds will not germinate. They are contained in a solid stone, so dense that "it cannot be broken with a hammer." Two years must pass before the stone decays, and then the kernels have perished also. Surely a curious state of things to have been reached by natural selection or any other process!

But this is not the only interesting fact which the author of this paper has to relate. The Bullogurra lake is an exception to the rule that all lakes and depressions which have no outlet should be salt. But at a depth of 12 feet below the fresh water is a bed of ground-water much more than twice as salt as the sea.

A species of wild clover or trefoil growing on the margin of the lake is infested with a dark-coloured aphis. "Horses feeding amongst it are attacked by the aphides, but only when they have white spots on their noses or feet." This the author justly pronounces "a new and extraordinary fact in natural history." But that our common green aphis is capable of attacking man we

know from recent experience. Passing under some lime trees we felt an irritation on the back of the left hand, much like that produced by the bite of a gnat. On looking we found that an ordinary green aphis in the winged state had settled on the spot. We brushed away the intruder, but the feeling of irritation remained for upwards of an hour.

A burrowing marsupial animal something larger than a rabbit was captured. It is the Betu of the blacks, and does not seem to have been often met with.

In a medical article entitled "Our Doctor" we note the very sensible remark:—"The special disease of modern life is worry." When will the believers in "progress" learn that they are moving in the wrong direction?

"Once a Month" has our best wishes.

Revista Internacional de Ciencias Médicas y Biologicas, fundada par Don Carlos de Vicente y Charpentier. Vol. I., No. 1. April 15, 1885. Madrid: Tipographia de los Heuérfanos.

THE successive chapters of this journal are devoted to medical physics, chemistry, microbiology, anatomy, physiology, therapeutics, medicine, neurology, surgery, obstetrics, hygiene, ophthalmology, and syphilography. Embryology, taxonomy, general psychology, palaeontology, and organic geography do not, if we may judge from the number before us, come within the plan of the journal. Anatomy, too, appears to be treated exclusively from a medical point of view, and with reference to mankind alone.

Hence for the non-medical biologist this journal offers little interest.

The Ecclesiastical Gazette.

IN this paper we perceive the notice of a book by Mr. W. Arthur entitled "Religion without God and God without Religion." The reviewer writes:—"A recent controversy in the 'Nineteenth Century' has revealed the existence of three schools of thought among modern positivists, championed respectively by Mr. Frederic Harrison, Mr. Herbert Spencer, and Sir Fitzjames Stephen."

We are far from accepting the tenets—especially those more recently developed—of the "Dux Syntheticorum," but we do not think that they can be at all rightly characterised as positivist.

The differences between the views of Auguste Comte and Mr. Herbert Spencer are fundamental.

CORRESPONDENCE.

*** The Editor does not hold himself responsible for statements of facts or opinions expressed in Correspondence, or in Articles bearing the signature of their respective authors.

SCIENCE—PHYSICAL AND MENTAL—A SELF-INSPECTION.

In last month's "Journal of Science," as well as on several previous occasions during the last few years, I have endeavoured to set forth, as simply as possible, the above position under the term Hylo-Idealism or Phreno-Cosmism. In its ultimate form this only means that, while in no sense denying an outer world, it can impossibly be anything separate from the Self,—the two being strictly *solidaire*,—so that it really is a pre- and indeed anti-scientific heresy to speak of externality in a syntaxis which, though seemingly double, is really single, and therefore logically admits of no such duality. Subject and Object, to use convenient terms, thus merge in an actual *Auto-morphosis* or Self formation, or Creation. Thus all the world with which we have to do is a relative and phenomenal one,—in other words a phantom, symptom, spectrum, or idea of each formative mind,—a state of Consciousness, nothing outside that snbjective sphere, and which Science, now-a-days, *must* identify with Cerebration. On this thesis—the *data* for which seem utterly irresistible at our present standpoint both of Physical and Mental Science—Materialism seems victorious along the whole line, and Spiritualism, or Supernaturalism, in any shape, seems utterly put out of Court; relegated completely to the same limbo as Astrology, Alchemy, and other *Pseudo*-sciences and Black Arts. Matter and Force—so called, living and dead, a distinction without difference, since the artificial manufacture of *urea* and other organic compounds—proclaim themselves sole masters of the field of knowledge; what has been mistaken for Spirit being material energy, force, or action, the product, not the source, cause, or active agent in all operations, organic or inorganic, and which, as the special vitality of the Brain, cognised as Mind, with its other cognomens of Soul, Spirit, &c., which are really material not "spiritual" terms. In no language framed by man has it been possible to invent phraseology to distinguish

such non-entities, of which human reason can take no account whatever. Man thus can think nothing higher than Self, and all notions that thus transcend humanity are seen to be Utopian dreams of its non-age. As I have before stated, this vital theory seems to be the only equitable one. As centripetal it confines our activity strictly within the confines of Self, any other which transcends such natural limits being demonstrably incompatible with just views of personal responsibility and free will, to say nothing of its incoherence. Religion thus, as Self adoration, quite disappears. Hygiene, or complete culture of body, intra- as well as extra-cranial, is its more than substitute.

ROBERT LEWINS, M.D.

MR. O. DAWSON ON DARWIN'S MASTERPIECE.

WITHOUT intending to decide whether Mr. Dawson, in writing the article which figures in your last number, had any other object in view save to damage Darwin's reputation (a question more difficult than important), I must beg leave to call attention to a passage of apparently wider scope. Mr. Dawson asks—"When will these blind partners, tottering Theism and capering Agnosticism, curvet together into the proverbial ditch?"

I ask, supposing Theism and Agnosticism both disposed of, what remains? Blank, dogmatic Atheism, which is fast becoming recognised by all minds above the "Cat and Ladle" level as simply unthinkable, or perhaps Positivism. Now Positivism must either deny the existence of any Being higher than man, or it must declare that we know nothing about such a Being. In the former case it is simply Atheism, in the latter a form of Agnosticism!

T. G.

DARWIN AND MR. OSWALD DAWSON.

IN the very curious article by Mr. Dawson which you have thought proper to insert at the beginning of your issue for the present month, I note the following most curious passage:—"It has been proposed that in that edifice [Westminster Abbey] a medallion be placed, purchased with a margin of the Darwin Memorial Fund not absorbed by the statue or devoted to the promotion of *biological* [italics Mr. Dawson's] research, in honour of the writer on Coral Reefs, Volcanic Islands, South American Geology, and the Formation of Mould." It will be, I

hope, no breach of courtesy to remind Mr. Dawson of the open fact that Darwin is also the writer on the Movements and Habits of Climbing Plants, of a monograph on the Cirripedia, on the Fertilisation of Orchids, on the Expression of Emotions in Man and Animals, and on the Variation of Animals and Plants under Domestication,—all *biological* works. Mr. Dawson will also find, if he reads the treatise on the Formation of Mould, that this is distinctly a biological work, since that formation is traced to the action of an animal.

F. E. S.

THE PROPORTIONS OF THE SEXES.

A CORRESPONDENT in your August issue (p. 497) suggests some very interesting experiments in incubation. In insects the sex of an individual seems not to be determined until towards the end of the larval stage. At least entomologists who rear moths and butterflies contend that when the food-supply is scanty the majority of perfect insects produced are males, whilst if food is superabundant females preponderate. In the human species the respective proportions of male and female children are neither alike in all countries. Unless my memory deceives me the proportion of male births in England is increasing, and the total birth-rate during the last few years decreasing,—both matters for congratulation.

ZERO.

THE BALANCE OF NATURE.

THAT "numbers invite enemies," as your correspondent H. Browne says, is undeniable. The pests which ravage the vegetable world seem to have only assumed formidable proportions since fields, plantations, and orchards afforded them scope. There can be no doubt that Aphides are far more plentiful in England now than they were half a century ago. The rose-growers whom I knew in my young days had little trouble with "green-fly," but their successors have to play away with soap-suds and water, as if upon a conflagration, to keep their rose trees clean. This year a black Aphis is in fashion.

RICHMOND.

INSANITATION AT THE WEST-END.

We dwellers in modern London often hear with wonder, indignation, and transitory good resolutions, of the conditions under which too many of the poor are at present living. But what shall we say if told that in many of the most sumptuous mansions at the West-End a part of the inmates exist under sanitary conditions equally bad? Yet such is the fact: the kitchens and their appendages are, in the more favourable cases, placed in a scantily-lighted sunk storey, in which ventilation without special machinery is impossible. But in other cases they are without windows, and are lighted by gas in both day and night. I have heard of a case—I fear not solitary—in which the cook had no other sleeping apartment save the kitchen (!), her bed being contained in a kind of chest which was drawn out of a recess when the day's work was at an end. The other servants, male and female, slept also in underground cells devoid of light and fresh air. As to the "sanitary arrangements," euphemistically so called, as you remark on a former occasion, they are as inadequate and ill-kept as they could possibly be in any tenement dwelling, or in the establishment of any "monopolist draper." Of all these abominations the master and the mistress of the house know nothing, and it is only the family doctor who ever suspects what kind of life there is below-stairs. He, too, must speak with bated breath, or a less observant practitioner will speedily be consulted in his stead.

Now I agree with the views developed by you in a paper on the "Limits of Sanitary Reform," that an occasional pestilence is a smaller evil than conditions which gradually sap the vitality of *any* portion of the community, and cause them to transmit enfeebled constitutions to the next generation. I hold that no person should under any pretext place a number of his countrymen and countrywomen in conditions where health and vigour are impossible.

But I may appeal not only to the conscience, but to the fears of the occupiers of such dwellings. It is surely neither safe nor pleasant to consume food prepared in such atmospheres as that which I have described. It is surely unsafe to live and sleep above subterranean dens of the kind just mentioned. Unpleasant—perhaps infectious—fumes and germs *will* ascend, and occcasion mysterious and unaccountable outbreaks of sickness. Dr. B. W. Richardson was not wrong in recommending that in all large mansions the kitchen should be in the topmost storey.

S. D

SUN-SPOTS AND THE WEATHER.

BEFORE ascribing to the sun's spots, or to the conjunctions of the planets, or to any other cosmic cause, a decided influence upon the weather, we must surely be able to show that any given season is exceptionally hot or cold, wet or dry, as the case may be, over the whole world, or at least over an entire hemisphere, northern or southern. But we find no such uniformity. If we look at the last winter, we see it mild in Britain, exceptionally rigorous in Spain, especially in Granada at the time of the disastrous earthquakes, in Southern France, Austria, and in the United States.

Turning to the present summer we find it abnormally cold and wet in Iceland and on the west coast of Norway, cold and dry in Britain, the polar current prevailing in July and August, and unusually cold in South Africa, which is of course now having its winter. Yet all the while Russia is having a season not merely dry, but abnormally warm, to such an extent as to injure the grain crops.

Similar discrepancies between the weather in the East and in the West of Europe have been noted in former seasons. What, then, can be the meaning either of the scarcity or the abundance of sun-spots?

CLOUD-GAZER.

SPIRITUALISM AND SCIENCE.

IT would be unwise were I to defend the position which I took in my article in your July number without awaiting the finishing of the reply by "The Author of Scientific Materialism." But I cannot help referring to one of the misconstructions of my views in which Mr. A. R. Wallace has indulged, in his paper in "Light" for July 11th. I nowhere assert or imply, as he puts it, that "if Spirits exist and communicate with men they *must necessarily* know more of the material universe than men do, and *must* communicate their superior knowledge to us."

Now Swedenborg represents his Spirits as giving particulars concerning Jupiter and Saturn,—not too harmonious with the results reached by modern astronomical research,—and consequently as both knowing more of the material universe than men and as being willing to communicate such knowledge. I merely point out the improbability of such Spirits being either totally ignorant of the very existence of Uranus and Neptune, or being unwilling

to communicate it. This point has been raised by others before me (without any reference to Spiritualism), and it has been generally accepted as fatal to Swedenborg's alleged revelations.

R. M. N.

"R. M. N" ON SPIRITUALISM.

I SUBMIT that your correspondent R. M. N. verges upon inconsistency. He evidently admits the alleged Spiritualist manifestations; he says that "there is nothing to be gained, and possibly there may be much to be lost, by persisting in an attitude of blank sweeping denial." Yet in the sequel he evidently takes a position hostile to Spiritualism.

A LUCRETIAN.

NOTES.

THE Metropolitan Board of Works obstinately persist, at a cost of from £3000 to £4000 per week, in their attempts to "deodorise" the Thames.

An "electric girl" is now being exhibited at the Albert Palace. A writer in a contemporary received a "violent shock" on taking hold of her hand, and on putting a finger into a glass of water in which this girl had placed hers "the shock was almost stronger." (!) A man who felt nothing is accused of stupidity for saying "You must all have fancied it." Has any competent electrician observed and measured this electric action?

In the "American Naturalist" A. L. Ewing describes a hermaphrodite crab (*Callinectes hastatus*), in which, however, neither the male nor the female organs were normally developed.

According to "Science" an American Silurian scorpion was found on November 10th, 1882.

The number of Tertiary fossil plants is estimated by L. F. Ward ("American Naturalist") at 5000.

H. Hale ("Science") states that the average stature of the Patagonians, including both sexes, is 5 feet 10 inches. It is further considered that, in the two centuries since they assumed equestrian habits, their legs have decreased in length by 2 inches. So that their former mean stature must have been 6 feet.

Says the "American Naturalist"—"It is a great error to confound criticism on behalf of the truth with personal hostility, yet it is an error by no means rare."

According to the "Deutsche Rundschau," in 1882 two and a half "milliard" copies of newspapers were circulated through the Postal Union. The bulk of this matter being political, it is easy to see that America is not the only country which—in the language of our late contributor Dr. G. M. Beard—is trying the ruinous experiment of making every man, woman, and child an expert in politics.

M. G. Carlet ("Comptes Rendus") has made a re-examination of the structure and the movement of the blades in the sting of the bee. It is not merely a perforating tool, but an aspirating and ejecting syringe, which fills and empties itself at every stroke of the piston.

According to MM. Lépine and P. Aubert, an examination of the poisonous character of urine shows that in the normal excretion the toxicity of the ash forms at least 85 per cent of the total toxicity, whilst in certain febrile urines the toxicity of the ash is only 55 per cent, the residue being due to the organic matter.

Dr. C. S. Minot ("Science") gives a curious instance of a lady who associated the months, or the names of the months, with certain colours: January, February, and March being bright yellow; April, blue; May, a light yellow; June, bright green; July, glaring yellow; August, orange; September, a golden brown; October, dark brown; November and December, grey.

The vacancy among the Trustees of the British Museum, left by the death of Lord Haughton, could not be better filled than by Lord Walsingham,—a far more suitable man.

M. A. Millot has effected a new synthesis of urea by the electrolysis of dilute ammonia, wood-charcoal being used as the positive electrode.

According to MM. Lépine and Roux, as communicated to the French Academy of Sciences, *Micrococcus ureæ*, if introduced into the urinary passages of a healthy animal, occasions cistitis and nephritis.

Prof. E. D. Cope ("American Naturalist") considers that, as far as the future of the human race is concerned, "the only cause for regret is the apparent inability of the best intellect to reproduce itself in any abundance."

Dr. B. W. Richardson, F.R.S., finds a scientific basis for the saying that a cat has nine lives. If a cat and a dog are shut up in the same "lethal chamber," the cat survives on the average three times as long, and in one instance nine times.

Says the "Popular Science Monthly," in an article on "Officialism in Education," "We do mean that in every official system the official or bureaucratic spirit is a constantly growing force, and must tend to a stereotyping of methods, and to a more or less barren uniformity in the minds moulded under its influence."

Sen. P. Tacchini ("Comptes Rendus") observed, on the summit of Etna, beneath a pure sky of a very deep blue, the sun surrounded with a white halo, concentric with a coppery red corona. Since July 2nd the phenomena observed in 1883 and 1884, after sunset and before sunrise, have reappeared.

The following is forwarded us by a contributor:—"Dr. William W. Ireland, of Preston Lodge, has in the press a work entitled

'The Blot upon the Brain: Studies in the History of Psychology.' It treats of the hallucinations of Mahomet, Luther, Joan of Arc, Swedenborg, the insanity of the Cæsars and of Ivan the Terrible, and the hereditary neurosis of the royal family of Spain, &c. Messrs. Bell and Bradfute are the publishers.

The progress of sexual evolution in the animal kingdom resolves itself into three main stages,—germiparity, hermaphroditism, and unisexuality.

J. D. Caton ("American Naturalist") has discovered a species of blind fishes in the water of an Artesian well, 170 feet in depth, in California. Artesian wells in the Eastern States have already yielded eighteen species of sightless fishes.

S. N. Rhoads, in the same journal, gives some instances of the tenacity of life of the raccoon. We suspect that if this animal were placed in Dr. B. W. Richardson's asphyxiating chamber it would outlive the cat.

"Cosmos les Mondes," on the faith of German journals not named, gives an account of the electro-magnetic properties of a plant, *Phytolacca electrica*. On breaking a stem the hand receives a shock like that given by the conductor of an induction-coil. At the distance of 6 metres the needle is affected, and becomes quite deranged if brought nearer. This energy reaches its maximum at 2 p.m., and almost disappears at nightfall. No bird or insect ever alights upon the plant!

The general Congress of Geologists was adjourned last year for fear of the cholera. This year the Social Science Congress declines to meet for fear of another disease,—the General Election.

We see, in an exchange, mention of a rain of small tortoises which took place at Raleigh, in North Carolina. These animals, from their flattened form and higher specific gravity, are more rarely carried through the air than frogs or fishes.

The supply of fleas in Paris is said to have greatly fallen off this season, a fact which some persons connect with the possible approach of the cholera.

Professor Chevreul entered upon his hundredth year yesterday (August 31st).

Lake Mono, the "Dead Sea of the West," is situate in the county Mono, in California. This sheet of water, 90 miles long by 18 in width, is so intensely alkaline that nothing can live in it. Its shores are barren and desolate.

The old story of a battle between a spider and a toad, in which the latter when bitten had recourse to plantain leaves as an antidote, has been revived, and is being reproduced with variations. M. Lataste points out that the toothless toad would have

some difficulty in chewing the leaves of the plantain, whilst any small animal biting the back of a toad would soon perish from the venom contained in the dorsal pustules.

The Mariano de la Barcena ("American Naturalist"), in describing some fossilised human bones found near the city of Mexico, mentions that the canine teeth are not conical, but have the same shape as the incisors.

The death of the great bureaucratic *savant* H. Milne-Edwards has called forth from his friend M. de Quatrefages an exaggerated eulogium, which contrasts strangely with the scanty laurels which the speaker, three years ago, strewed on the tomb of a far greater naturalist.

MM. P. Brouardel and Paul Loye have studied the poisonous action of hydrogen sulphide. They distinguish two forms,—the one instantaneous, due to the action upon the nerve-centres, and the other slower, showing a combination of cerebral symptoms with those due to asphyxia.

From "Science" we learn that on July 4th the American Board of Control of the Theosophical Society passed a resolution "That the Theosophical Society shall assume and exercise supervision of the American Society for Psychical Research." They further "authorised and required" one of their own number "to act as censor of the said American Society for Psychical Research, and to publicly review and criticise any and all of the Proceedings, Transactions, &c., which the said Society may publish, at his judgment and discretion." They further "expressly require him, when any fact in psychic science shall have been satisfactorily established by the American Society for Psychical Research, to explain such fact to the said American Society, according to the doctrines and upon the principles of psychic science, of which the Theosophical Society is the custodian in the United States."

"Science," in commenting very temperately on this amazing piece of assumption, asks "What body will come forward to 'assume and exercise' supervision of the American Board of Control of the Theosophical Society?"

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